CHAPTER THREE
AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the condition of the human and natural environment in the project area as it currently exists. Each resource is described separately. Where appropriate, the discussion begins with a description of the management objectives reached by the BLM for each resource in the 1988 Pinedale RMP. These RMP objectives provide the management direction for public lands in the PAPA and were designed to provide for multiple use management of the public lands and resources. The Pinedale RMP was designed to be maintained, amended, and revised as demands on public lands and resources change, as the land and resource conditions change, and as new information is acquired by the BLM.

This chapter describes the concept of sensitive resource management zones (SRMZs). An SRMZ is an area that contains resources that require specific surface disturbance limitations, seasonal construction constraints, monitoring or other actions to assure that undue impacts to the resource do not occur. These SRMZs occupy distinct spatial areas and maps are provided to show their locations. In many cases, SRMZs for a number of resources overlap. For instance, it is common on the Mesa to have areas located within mule deer crucial winter range, sage grouse nesting habitat, and steep slope SRMZs. Specific recommendations to eliminate undue impacts in each of the SRMZs are contained in Chapter 4.

To address the overlapping SRMZs, the BLM has divided the entire PAPA into the 9 distinct Management Areas (MA) shown on Figure 2-11. MAs 1 through 8 apply only to Federal lands and minerals. All non-Federal lands and minerals have been combined into MA 9. Each of the MAs have different management objectives based on the combination of SRMZs present. The acreage of each MA in the PAPA is provided on Table 2-7.

The level of information provided in this chapter is commensurate with the potential impacts to the resource described. Where few minor impacts are expected to occur, only a brief description of the resource is provided. More detailed information is provided for resources which are expected to be impacted significantly by the alternatives.

Relatively little disturbance has occurred in most of the PAPA. To date, 41 wells have been drilled in the 308 square mile project area since 1939 - 30 are active and 11 have been plugged and abandoned. Although there are a number of roads, many are two-tracks which are traveled only infrequently. A number of homes and ranch buildings exist in the PAPA but these are primarily limited to the general vicinity of the river flood plains. The most dense housing is located near Pinedale adjacent to the north end of the PAPA. Industrial activities are located in an industrial park on the north side of the project area, west of the town of Pinedale. Oil and gas development to date has impacted only a very small portion of the PAPA.

The BLM recently prepared the Bird Canyon-Opal Pipeline, Granger Spur Pipeline, and One Compressor Station Environmental Assessment (EA) that addressed the impacts associated with construction of additional pipeline capacity in the same corridor which would also be used to construct the sales pipelines for this project. That EA (BLM, 1998a) provides a detailed description of the existing pipeline corridor. Therefore, this EIS only briefly summarizes the existing environment of that corridor for resources which may be affected by construction of the sales pipelines. For a more complete description, the reader should refer to the recent EA.

BLM Manual H-1790-1 lists critical elements that must be addressed in every EIS. These are: air quality, areas of critical environmental concern, cultural resources, environmental justice (impacts on minorities), farm lands, flood plains, native American religious concerns, threatened or endangered species, wastes (hazardous or solid), water quality, wetlands/riparian zones, wild and scenic rivers, and wilderness. All except two are potentially affected. Areas of critical environmental concern and wild and scenic rivers are not affected. All others are addressed in a level of detail commensurate with the degree of impact to that critical element or resource.

3.2 Land and Mineral Ownership in the Project Area

The PAPA consists of approximately 308 square miles (197,345 acres). Table 3-1 summarizes surface and mineral ownership. The project area consists of primarily Federal lands and minerals. Figure 3-1 shows surface and mineral ownership in the PAPA. Most of the private lands are located adjacent to the rivers whereas Federal lands are primarily located on the uplands.

All but 7.4 square miles of the Federal minerals within the PAPA have been leased. Some of the leases on Federal lands were issued in the early 1950s and contain little, if any, measures to protect the environment. On private and state lands, the leases give the operators the right to develop mineral resources consistent with the conditions of the lease.

Table 3-1
Surface and Mineral Ownership in the Project Area

	Surface Ownership		Mineral Ownership	
	Acres	Percent	Acres	Percent
Federal	157,719	79.9	164,145	83.2
State	9,766	5.0	11,379	5.8
Private	29,860	15.1	21,821	11.0
Total	197,345	100	197,345	100

3.3 Disturbed Acreage in the Project Area

The first well was drilled in the PAPA in 1939. However, until recently there has been only sporadic interest in developing the anticline's gas resources. As of January 1, 1999 only 41 wells have been drilled in the over 300 square mile PAPA. Seven additional well pads have been constructed but have not been drilled. Approximately 51 miles of road have been constructed in the PAPA to support gas development activities. In addition, 66 miles of gathering pipeline have been installed (both buried and aboveground). Table 3-2 summarizes existing disturbance in the PAPA, including wells that have been abandoned and reclaimed. Total disturbance in the PAPA to date is estimated at 3,224 acres (1.6 percent). This disturbance does not include cropland or pasture acreage. As was discussed in Chapter 1 of this EIS, the BLM has approved limited drilling on Federal lands to, among other things, begin to understand the potential for development of the reservoir(s). Disturbance associated with these wells is included in Table 3-2. The location of existing disturbance is shown on Figure 3-2.

3.4 Climate

The climate of the PAPA is semiarid and continental with short, dry summers and long, cold winters. Mean annual air temperature for Pinedale is about 12.4° F in January and about 59.9° F in July. Temperatures recorded in Pinedale show a wide range between daily maximum and minimums. This is predominantly due to high elevation and dry air which permits rapid incoming and outgoing solar radiation. Freezing temperatures can occur any month of the year (Martner, 1986). Mean annual precipitation is about 10 inches with most occurring as rainfall. Peak precipitation is received in the spring. The growing season is about 90 days. Plant growth begins about April 1 and continues to about July 1. Fall growth will usually occur if moisture is available.

3.5 Socioeconomic Resources

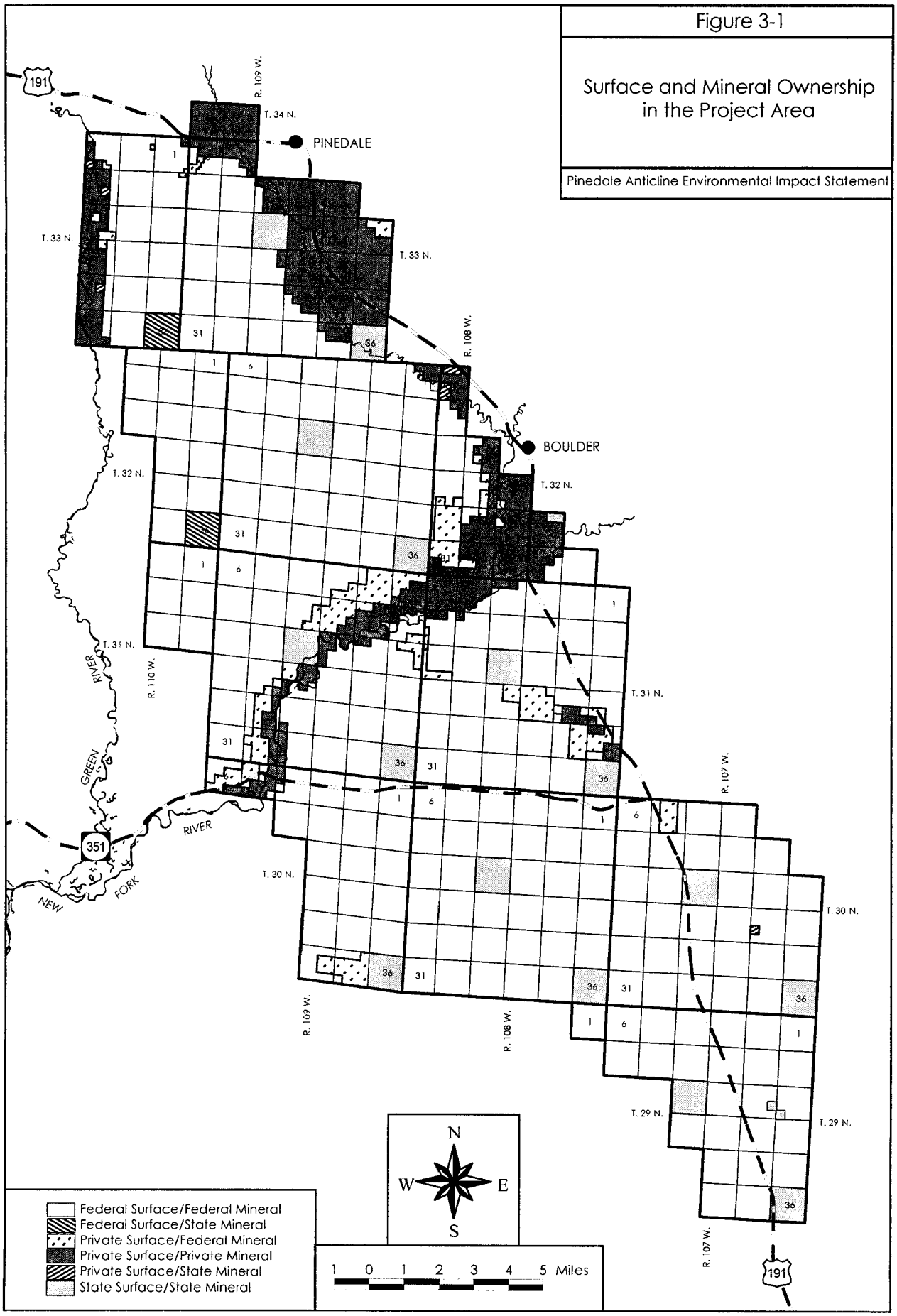
Sublette County's heritage is based on ranching and it remains one of the least populated, last developed areas in the nation. In some cases, third- and fourth-generation ranchers still live on the family's original homestead and occasionally still occupy the original homestead ranch house (Rosenburg, 1990).

Oil and gas has played a significant role in Sublette County's economy since the 1920s. Historically, most of the oil and gas activity was limited to the LaBarge area in the southwestern part of the county but, with the recent development of the Jonah II Field on the southern flank of the project area, oil and gas facilities now extend over much of the southern portion of the county. To many in the county, oil and gas development has brought mixed blessings. Although oil and gas development can be intrusive on the landscape and subject to uncontrollable market forces (resulting in boom and bust cycles in the local economy), it has made substantial contributions to the economy of Wyoming and Sublette County. According to Rosenburg (1990), by 1985, oil and gas paid over 80 percent of Sublette County's taxes.

Figure 3-1

Surface and Mineral Ownership in the Project Area

Pinedale Anticline Environmental Impact Statement



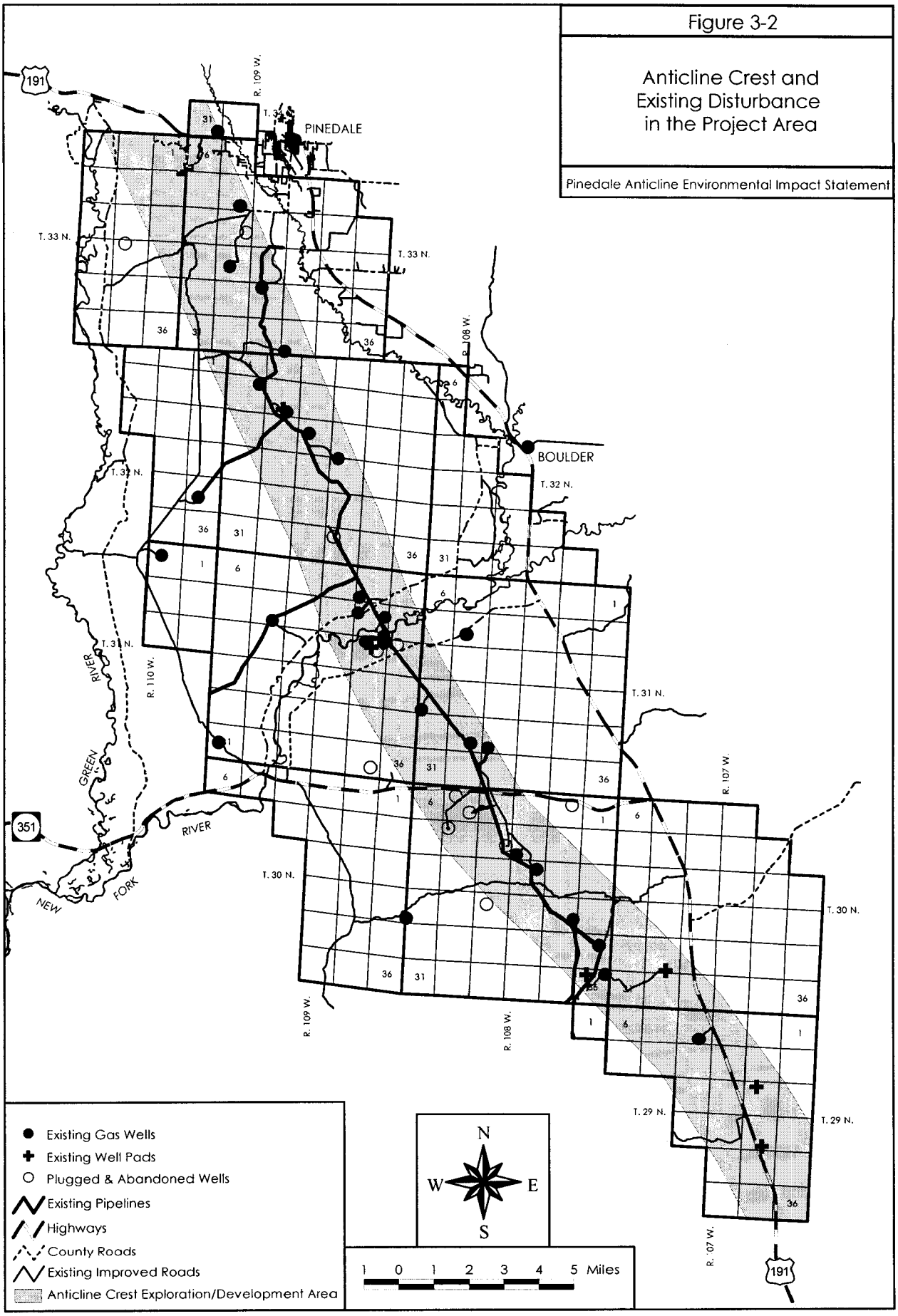


Figure 3-2
Anticline Crest and Existing Disturbance in the Project Area
Pinedale Anticline Environmental Impact Statement
PINEDALE
BOULDER
T. 33 N.
T. 32 N.
T. 31 N.
T. 30 N.
T. 29 N.
R. 109 W.
R. 108 W.
R. 107 W.
R. 110 W.
GREEN RIVER
NEW FORK RIVER
191
351
Existing Gas Wells
Existing Well Pads
Plugged & Abandoned Wells
Existing Pipelines
Highways
County Roads
Existing Improved Roads
Anticline Crest Exploration/Development Area
N
W
E
S
1 0 1 2 3 4 5 Miles

Table 3-2
Disturbed Acreage in the Project Area

Disturbance Type	Number/Miles/ Acres	Acres Disturbed Public Lands	Acres Disturbed Private Lands	Acres Disturbed State Lands	Total Disturbance (acres)
Well pads (1)	48 wells	114	21	9	144
Gathering pipelines (2)	66.4 miles	217.6	20.5	14.6	252.7
Improved roads (3)	134.6 miles	272.7	91.3	27.6	391.6
Non-oil and gas roads (4)	80.8 miles	295.2	167.7	26.7	489.6
Unimproved roads (5)	311.7 miles	402.3	34	17	453.3
Industrial development (6)	661 acres	8.3	531.3	111.4	651
Residential areas	860.1 acres	0	842	0	842
Total		1,310.1	1,707.8	206.3	3,224.2

1 = Assumes well pads disturb an average of 3 acres during construction. Includes plugged and abandoned wells that have been reclaimed.
2 = Excludes 24.7 miles of surface pipeline. Disturbance assumes a 50-foot wide right-of-way. This disturbance has been reclaimed.
3 = Includes 50.9 miles of access roads associated with oil and gas development along with existing improved or graded roads such as the Burma and Mesa roads. Assumes an average disturbance width of 24 feet.
4 = Includes U.S. Highway 191, State Highway 351 and county roads. Assumes an average disturbance width of 50 feet.
5 = Unimproved roads are two-tracks which receive only casual use. Assumes an average disturbance width of 12 feet.
6 = Includes the industrial park, county sanitary transfer station and gravel pits. The estimate is based on photo interpretation.

Revenues from oil and gas continue to play a significant role in the area's economy and the contribution from oil and gas revenues is expected to grow. In a 1997 survey, the University of Wyoming reported that residents tended to believe that oil and gas will be more important than the hospitality or agriculture industry in Sublette County in the next 10 years (McLeod et al., 1997). In response to scoping for this project, the Mayor of Pinedale succinctly described the importance of oil and gas revenue in the local economy: She stated "*In my position as mayor of a municipality, I know how important the revenues are which flow to the state, counties and towns from severance taxes and mineral royalties. Without this revenue source we could not provide roads, streets, sewers, water lines, fire protection, law enforcement, ambulances, schools and all the other necessities and amenities that Wyoming's people enjoy...Sales taxes alone cannot bear the total burden. Existing gas and oil field production in Wyoming is declining. We must develop new areas.*" (Skinner, 1998).

According to the Sublette County Assessor (Montgomery, 1998), during the 1998 fiscal year (July, 1997 to June, 1998), minerals accounted for over 75 percent of the total assessed valuation for Sublette County. By comparison, residential properties accounted for only about 9 percent of the total valuation and agriculture was less than 3 percent.

Pinedale is located in the north portion of the PAPA and is considered the gateway to the Wind River Range and the Bridger Wilderness Area, as well as to Teton and Yellowstone National Parks. Tourism is increasingly important to the local economy and Pinedale offers a staging area for wilderness escapes, fishing, hunting, backpacking and hiking, mountain biking, wildlife viewing and snowmobiling. The Pinedale Chamber of Commerce boasts that visitors will find western hospitality, fantastic scenery and few crowds.

The area's uniquely beautiful country and relative lack of development have been "discovered" by the outside world. Sublette County has been growing faster than the state average and, according to McLeod et al. (1997), during the next 5 years Sublette County is expected to grow faster than Teton County (which includes Jackson Hole). Sublette County grew 15.2 percent from 1990 to 1996 compared to 5.8 percent growth statewide (Wyoming Department of Administration and Information, 1997a). The county is expected to grow an additional 10 percent by the year 2001. That will be more than a 20 percent increase in population over a 10-year period in one of Wyoming's most rural counties (McLeod et al., 1997).

Fifty-four percent of the county's private property owners live outside the county and 27 percent live outside the state (McLeod et al., 1997). Second home development is increasing in the area and more people are choosing the Pinedale area as a

recreation destination rather than a place to stop overnight on the way to the parks.

However, this growth has resulted in a unique set of problems. Rosenburg (1990) summarized the condition of the area as follows: *"...tourists and part-time residents inevitably bring the trappings of the twentieth-century life with them, repeating the very environment they try so hard to leave behind. The southern half of the county has its crop of oil and gas wells, but one need only take a drive up the Green River Lakes Road and view the vacation homes sprouting up along that mighty river to feel another force of the twentieth century. During the spring and fall cattle drives in the valley, the cattle, cowboys, and horses must weave their way among the split-level wood and glass homes".*

The residents of Sublette County treasure their quality of life and many choose to stay regardless of better economic opportunities elsewhere. When asked why they lived/owned property in the county, McLeod et al. (1997) reported the following reasons were given by residents in descending order of importance: rural lifestyle, scenery, low population, recreation opportunities, air and water quality, and safety. Non-resident landowners listed scenery and recreation opportunities as the 2 most important reasons they bought property in Sublette County. All these reasons were identified as concerns during scoping.

However, the area's economy and infrastructure are very dependent upon revenues from oil and gas. Most residents understand that the Federal, state and private minerals have been leased and that development is going to occur. As a result, while expressing concern, very few residents have opposed continued natural gas exploration and development within the project area outright. Rather, they plead for orderly and controlled development that preserves the values and natural characteristics most important to the area's quality of life.

3.5.1 Socioeconomic Trends and Influences. The economy of Sublette County is characterized by ranching, natural gas operations, tourism and recreational activities. Since 1987, over 25 percent of the state's total natural gas production has been from Sublette County (Table 3-3).

Table 3-3
Natural Gas Production (MMCF) in Sublette County - 1981-1997

Year	Sublette County	Wyoming	Percent of State Total
1981	46,373	455,353	10.2
1982	48,816	465,142	10.5
1983	43,296	539,774	8.0
1984	46,678	600,138	7.8
1985	31,838	597,896	5.3
1986	85,053	586,974	14.5
1987	220,385	733,210	30.1
1988	215,131	811,554	26.5
1989	243,457	865,961	28.1
1990	262,734	897,925	29.3
1991	285,606	960,453	29.7
1992	301,953	1,011,968	29.8
1993	305,267	1,054,700	29.0
1994	316,693	1,102,932	28.7
1995	318,549	1,137,990	28.0
1996	324,813	1,173,519	27.7
1997	349,631	1,192,828	29.3

Source: Wyoming Department of Administration and Information (1997b)

Exxon's Shute Creek Project, which began operating in 1987, significantly increased Sublette County's contribution to total statewide natural gas production. The Jonah II Field is expected to further increase the county's contribution to statewide natural gas production. The Jonah II Field is currently the state's most productive sweet gas field producing over 200 MMCFD. Sublette County's contribution to statewide oil production has historically fluctuated between 1 and 2 percent. (Wyoming Department of Administration and Information, 1997b).

Sublette County's tax base is dependent on the mineral industry. Historically, 80 to 85 percent of county revenues have come from the mineral industry. Seventy-five percent of the 1998 assessed valuation for Sublette County was from the mineral industry. One reason minerals contribute such a large portion of the county's tax base is the fact that minerals are assessed at 100 percent of fair market value. Industrial property is assessed at 11.5 percent and residential property and agricultural property is assessed at 9.5 percent of fair market value.

Since the late 1970s, the profitability of ranching in Sublette County has been adversely impacted by a combination of high interest rates and falling cattle prices. Prices for ranch land began to recover in the early 1990s, influenced in part by rising property values in neighboring Teton County. The demand for property in Sublette County for use as summer/second homes has increased significantly and has been greatest in the northern portion of the county. However, this trend has resulted in increased land values in the southern part of the county as well.

Sublette County currently ranks 16th among Wyoming counties in terms of agricultural output (Wyoming Department of Administration and Information, 1997b). In 1997, the assessed value of agricultural lands in Sublette County was slightly over $4.1 million.

3.5.2 Population. In the 20-year period between 1975 and 1995, Wyoming's population grew by 25 percent. Growth in southwest Wyoming (Carbon, Lincoln, Sublette, Sweetwater, and Uinta counties), where much of the state's oil and gas production occurs, was more robust. During this period, the population of southwest Wyoming increased by 34.2 percent. The population of Sublette County increased by 33 percent between 1975 and 1995 (University of Wyoming, 1997).

Wyoming's increasing trend in population includes periods of contraction and expansion. The decade between 1975 and 1985 was an expansionary period, as high energy and commodity prices brought people to the state to work in mining, oil and gas and related industries. Over this time, the state's population increased 31.4 percent. The populations in both southwest Wyoming and Sublette County expanded by nearly one half (49.4 percent and 48.7 percent, respectively). The decade between 1985 and 1995 saw a 4 percent contraction in the state's population, as the energy market changed from boom to bust. As expected, the counties of southwest Wyoming, whose economies are more dependent on the oil and gas industries than the state average, experienced more significant contractions. Overall, the population of southwest Wyoming decreased by 10.2 percent, while Sublette County's population decreased by 10.3 percent.

The 1990 census records 4,843 people living in Sublette County - slightly over 1 percent of the state's total population. As shown in Table 3-4, Sublette County's population was forecast to total 5,780 in 1998. At 19 percent, the pace of growth in the county's population over the past decade exceeds that of the state (4.7 percent). However, the county's population continues to comprise just over 1 percent of statewide population.

Table 3-4
Sublette County Population

Year	Population
1987	5,358
1988	4,859
1989	4,714
1990	4,843
1991	4,960
1992	5,018
1993	5,179
1994	5,402
1995	5,510
1996	5,577
1997*	5,540
1998*	5,780

* forecasts; Wyoming Department of Administration and Information (1997b)

3.5.3 Employment and Income Levels. In 1996, the total number of employed persons in Sublette County was 2,934 and the unemployment rate was 3.6 percent. This compares with a statewide unemployment rate of 5 percent and an unemployment rate of 5.9 percent in southwest Wyoming (Wyoming Department of Administration and Information, 1997b). With few exceptions, the unemployment rate in Sublette County has been lower than that of other counties in southwest Wyoming (see Table 3-5). The temporarily high level of unemployment in Sublette County in 1987 resulted from completion of Exxon's Shute Creek Plant. Construction workers who migrated to the county became unemployed and eventually out-migrated.

Between 1975 and 1993, the number of employed persons in Sublette County increased by nearly 54 percent, while the county's population increased by

Table 3-5
Percent Unemployment for Sublette County and Southwest Wyoming

Year	Sublette County	Southwest Wyoming
1980	2.7	3.7
1981	2.3	3.7
1982	3.8	6.6
1983	7.7	9.9
1984	5.3	6.9
1985	4.7	6.9
1986	7.5	9.8
1987	12.2	11.4
1988	7.2	7.8
1989	5.4	7.2
1990	3.9	5.8
1991	3.5	5.8
1996*	3.6	5.9

Sources: University of Wyoming, 1997 (all years except 1996). 1996 figure from Wyoming Department of Administration and Information (1997b)

33 percent (University of Wyoming, 1997). This indicates an increase in the labor force participation rate. Over the past 20 years, increasing numbers of people in Sublette County have entered the labor force to seek employment. As evidenced by increasing employment levels, the county has largely been successful in creating jobs for them.

Wages and income levels in Sublette County have tended to lag behind state averages. In 1996, average annual wages in Sublette County were $20,777; 10 percent lower than the statewide annual wage rate of $22,870. As shown in Table 3-6, although per capita income in Sublette County increased 6.3 percent between 1991 and 1995, this was less than half of the gain in statewide per capita income (Wyoming Department of Administration and Information, 1997b).

Table 3-6
Annual Per Capita Income Levels

	1991	1995	Percent Change
Wyoming	$18,272	$20,712	13.4
Sublette County	$19,028	$20,221	6.3

Source: Wyoming Department of Administration and Information (1997b)

3.5.4 Economic Base: Sectoral Activity. Table 3-7 demonstrates the diversified employment base of Sublette County. Although these figures exclude self-employed persons, they show that no single industry is the dominant source of employment within the county. In 1995, industry earnings in Sublette County were highest in the government, mining, and services sectors (see Table 3-8). Between 1993 and 1995, with the exceptions of transportation and wholesale trade, all sectors of Sublette County's economy realized increased earnings. The finance industry experienced the greatest gain.

Table 3-7
Employment in Sublette County

Sector	1993	1995	Percent Change 1993-1995
Farming	398 (11.8%)	410 (11.6%)	3.0
Agricultural Services	92 (2.7%)	90 (2.5%)	-2.2
Mining (includes oil & gas)	326 (9.6%)	317 (9.0%)	- 2.8
Construction	314 (9.3%)	366 (10.3%)	16.6
Manufacturing	77 (2.3%)	94 (2.7%)	22.1
Transportation (TCPU) (1)	132 (3.9%)	131 (3.7%)	- 0.8
Wholesale Trade	57 (1.7%)	50 (1.4%)	- 12.3
Retail Trade	517 (15.3%)	551 (15.6%)	6.6
Finance (FIRE) (2)	204 (6.0%)	211 (6.0%)	3.4
Services	664 (19.6%)	691 (19.5%)	4.1
Government	604 (17.8%)	626 (17.7%)	3.6
Total	3,385 (100%)	3,537 (100%)	4.5

1 = includes transportation, communications and public utilities
2 = includes finance, insurance and real estate
Source: Wyoming Department of Administration and Information (1997b)

Between 1993 and 1995, the county's growth in employment was greatest in the manufacturing, construction, retail trade, and services industries. Employment growth in the mining sector was relatively flat. Wages in non-mining industries are significantly lower than wages earned in the mining

Table 3-8 Sublette County Industry Earnings			
Sector	**1993**	**1995**	**Percent Change 1991-1995**
Farming	$13,084	$4,820	-63
Ag. Services	$ 863	$ 884	2.4
Mining	$11,780	$12,632	7.2
Construction	$6,149	$7,620	23.9
Manufacturing	$ 601	$ 644	7.2
Transportation (TCPU)	$3,859	$3,763	-2.5
Wholesale Trade	$921	$ 711	-22.8
Retail Trade	$5,729	$6,601	15.2
Finance (FIRE)	$1,490	$2,036	36.6
Services	$9,060	$10,625	17.3
Government	$13,460	$14,868	10.5
Total	$66,996	$65,204	-2.7
Source: Wyoming Department of Information and Administration (1997b)			

industry. Across the state, construction and manufacturing wages are approximately half those of the mining industry. Wages in the services and retail trade sector are only one-third and one-quarter of mining wages, respectively.

3.5.5 Housing. Although Table 3-9 suggests an abundant supply of available housing in Sublette County, local realtors report a relatively tight supply of properties for rent and sale in Big Piney and Pinedale. The appearance of ample unoccupied housing is due to the high number of summer and second homes within Sublette County.

Table 3-9 1996 Housing Units in Sublette and Sweetwater Counties		
	Sublette County	**Sweetwater County**
Total housing units	3,210 (100%)	15,835 (100%)
Owner-occupied units	1,468 (45.7%)	9,552 (60.3%)
Renter-occupied units	635 (19.8%)	4,064 (25.7%)
Total unoccupied housing units	1,107 (34.5%)	2,219 (14.0%)
Source: Chaplin (1998)		

A mid-September, 1998 multiple listing for Sublette County recorded 17 residential rental properties in Pinedale. Monthly rental rates varied from $250 to $600, and averaged $510. At that time, 36 houses in Pinedale were listed for sale, with sale prices ranging from $50,000 to $370,000 and averaging $124,000. Residential listings included another 59 houses in the area surrounding Pinedale. Prices of these houses ranged from $29,500 to $485,000, with an average price of $207,000. Four houses were listed for sale in Big Piney, ranging in price from $52,000 to $192,000 and averaging $93,500.

Housing prices in Sublette County more than doubled between 1990 and 1997 (see Table 3-10). Houses in the rural area surrounding Pinedale experienced the greatest price increases (218 percent), while the price of houses in Big Piney experienced the smallest increase (15.7 percent). The overall escalation in housing prices in Sublette County is fueled by demand from outside the county, not by rising incomes within the county. While the average residential sales price in Sublette County nearly doubled between 1991 and 1995 ($61,928 to $122,099), annual per capita income in the county increased by only 6.3 percent.

Big Piney has an ample supply of unoccupied mobile home pads. According to an area realtor (Freedom Real Estate), the town's 4 mobile home courts are currently one-third to one-half full. A high mobile home capacity was built in the mid-1980s, when Big Piney housed nearly 3,000 Exxon workers.

Table 3-10 Average Residential Sale Prices in Sublette County		
	1990	**1997**
Sublette County	$55,896	$122,099
Big Piney	$50,150	$58,000
Marbleton	$55,062	$32,500
Pinedale	$46,360	$92,925
Pinedale rural	$70,212	$158,926
Source: Montgomery (1998)		

3.5.6 Infrastructure

Big Piney. Located along U.S. Highway 189, Big Piney had a recorded population of 454 in 1990 (Wyoming Treasurer's Office, 1998) and a projected

population of 478 in 1996 (Wyoming Department of Administration and Information, 1997b). The town is governed by a mayor and 4 elected council members. Big Piney is serviced by a volunteer fire department and 911 emergency services. Police services are provided through the county-wide Metro Services, which is headquartered in Pinedale. A deputy sheriff is located in Marbleton, 1 mile north of Big Piney. Government facilities include a town hall, post office, USFS Ranger Station and a branch library.

Big Piney has an elementary, junior high and high school. The 1997 enrollment of the Big Piney School District was 669 (Wyoming Department of Education, 1997). Child care facilities are provided in a school administration building. The town has 2 doctors, a physician's assistant, and emergency ambulance services. Big Piney has a small airport for private aircraft.

Big Piney has 2 motels, with a total of 40 to 45 beds. The town has 2 year-round, and one seasonal restaurant. The town has a bank, grocery store, convenience store, and approximately one dozen retail establishments. Local recreational facilities include the county fairground, 3 baseball diamonds, and a covered swimming pool. A newly-remodeled park will include a walking path and ice skating rink. Water wells provide the town's supply of drinking water. The Sublette County landfill is located near Big Piney.

Bondurant. Forty-five miles northwest of Pinedale, Bondurant is located near the Teton County border. The town has a population of 100. Bondurant has a post office, volunteer fire department, church, restaurant, and several outfitters. A K-5 elementary school is located in Bondurant; middle and high school students are bussed to Pinedale.

Boulder. Boulder is located 12 miles south of Pinedale, along U.S. Highway 191. Historically a ranching community, Boulder has a recorded population of 125. The town has a post office, gas station, motel, RV campground, and drilling support services.

Cora. Ten miles northwest of Pinedale, Cora has a post office and a small general store. Cora is a ranching community that has experienced recent growth with the building of several summer homes. Cora's recorded population is only 4.

Daniel. Located 11 miles west of Pinedale, Daniel is a ranching community with approximately 125 residents. The community has a post office and volunteer fire department.

Marbleton. Marbleton is located 1 mile north of Big Piney, along U.S. Highway 189. Marbleton had a recorded population of 634 in 1990 (Wyoming Treasurer's Office, 1998), and a forecast population of 689 in 1996 (Wyoming Department of Administration and Information, 1997b). The town is governed by a mayor and 4 elected council members. The town has a volunteer fire department, police services provided through Metro Services, and a county deputy sheriff. Marbleton has 2 motels, with an approximate bed capacity of 40, 3 restaurants, and a dentist. The town contains 3 trailer parks, with a total of 200 pads, and 6 apartment buildings.

Pinedale. Located along U.S. Highway 191, Pinedale had a recorded population of 1,181 in 1990 (Wyoming Treasurer's Office, 1998) and a forecast population of 1,274 in 1996 (Wyoming Department of Administration and Information, 1997b). The town is governed by a mayor and 4 council members. Government offices include a post office, USFS Ranger Station, and offices of the BLM, Natural Resource Conservation Service, and Wyoming Game and Fish Department (WGFD). Sublette County offices are located in Pinedale. Pinedale has a volunteer fire department, contracted police services through the county-wide Metro Services, 911 emergency service, and county sheriff. Community and cultural facilities include 2 senior centers, 4 non-residential child care facilities, a municipal auditorium, a recently-expanded library, and the Museum of the Mountain Man.

Pinedale has an elementary, middle, and high school. Enrollment in the Pinedale School District in 1997 was 642 (Wyoming Department of Education, 1997). Medical services include a clinic, public health nurse, pharmacy, and volunteer ambulance. The nearest hospitals are in Rock Springs and Jackson. An airport, providing tie downs, hanger space, and courtesy car, is located 8 miles south of Pinedale.

Pinedale has 11 motels (some are seasonal) and 4 bed and breakfast establishments, with a total of approximately 175 beds. Two RV campgrounds are located near Pinedale. Fourteen restaurants are open year-round, and another 3 are open seasonally. There is a bank, grocery store, 2 convenience stores, a self-serve laundromat, and several retail establishments. Local recreation facilities include an indoor swimming pool, racquet ball courts, golf course, ice skating rink, and bike path.

3.5.7 County and Local Government Revenues

Sublette County. A 4 percent state sales and use tax rate applies in Sublette County. County sales and use tax revenues from mining activities (almost exclusively natural gas) totaled $656,949 in fiscal year (FY) 1997. This accounted for 18.5 percent of the county's total sales and use tax collections in that year. FY 1997 county sales and use tax collections from the mining industry were significantly higher than collections in both FY 1996 and FY 1995. In FY 1996, mineral sales and use taxes contributed only 5.4 percent to total sales and use tax collections, while in FY 1996 they accounted for 8.3 percent of the total (Wyoming Department of Administration and Information, 1997c).

Sublette County's portion of sales and use taxes returned by the state is distributed amongst the county and its incorporated towns based on population. Historically, the percentages distributed to the county and the Towns of Big Piney, Marbleton and Pinedale have been consistent from year to year. According to the Wyoming Department of Revenue, from FY 1990 through FY 1998, Sublette County received 53.1 percent of returned sales and use taxes, Big Piney received 9.9 percent, Pinedale 24.2 percent, and Marbleton 12.8 percent. (Wyoming Department of Revenue, 1990-1997).

As shown in Table 3-11, minerals account for 75 percent of Sublette County's 1998 total assessed value. Natural gas contributes 99.7 percent to the $282.8 million assessed value for minerals. The remaining 0.3 percent comes from gravel operations. The natural gas industry is the primary source of Sublette County tax revenues for two reasons. The first is the large amount of natural gas produced in the county. In 1997, Sublette County was the largest producer of natural gas in the state with 29.3 percent of the total. The second reason is that mineral production is assessed at 100 percent of its market value, compared to partial valuation for industrial, commercial, agricultural and residential property values.

Table 3-11
Composition of Sublette County's 1998 Assessed Valuation

	Assessed Valuation	Percent of Total Valuation
Utilities	$3,503,360	0.9
Commercial	$5,360,311	1.4
Agriculture	$10,630,564	2.8
Residential	$32,714,234	8.7
Industrial	$41,322,591	10.9
Minerals	$282,841,302	75.3
Total	$376,372,362	100

Source: Montgomery (1998)

Just over 36 percent of Sublette County's $8.9 million General Fund for FY 1999 comes from ad valorem taxes (property taxes). Ad valorem taxes have made an increasing contribution to this fund over the past 3 years. In FY 1998 ad valorem taxes made up 29.8 percent of the County's $7.9 million General Fund. Ad valorem taxes contributed 24.8 percent to the county's FY 1997 $7.7 million General Fund. For FY 1999, other revenue sources provide 35 percent of the General Fund. Sales and use tax collections are the largest contributor to these additional funds, providing 18.4 percent of all non-ad valorem revenues in the county. Severance taxes comprise another 2.2 percent of the county's current non-ad valorem revenues (Sublette County, 1998).

Pinedale. Pinedale's municipal valuation increased 9.4 percent between FY 1996 ($7,746,492) and FY 1997 ($8,471,575) (Wyoming Department of Revenue, 1996 and 1997). FY 1997 General Fund revenues for the Town of Pinedale were unexpectedly high (totaling $1,620,620). This was due in large part to high sales and use tax revenues returned from the state. Sales and use taxes contributed 32 percent ($513,450) to the FY 1997 General Fund. Mineral revenue-sharing from the state contributed 12 percent ($199,770), and property taxes provided 5 percent ($84,666)(Rashish, 1998).

Pinedale's FY 1998 budget is projected at a more conservative $897,065. Mineral tax revenue-sharing contributes 22 percent ($199,770) to the estimated General Fund. Projected mineral royalty distributions total $130,256, with severance taxes comprising $69,514.

The General Fund for the Town of Pinedale is distributed among the following town services: administration, animal control, fire department, mosquito control, municipal court, parks/recreation, planning, police, public works, sanitation, and streets. The amount received by each service category varies on a quarterly basis, and is determined by the mayor and town council.

Big Piney. The municipal valuation of Big Piney increased 3.2 percent between 1996 ($1,338,749) and 1997 ($1,381,304)(Wyoming Department of Revenue, 1996 and 1997). Municipal property taxes totaled $11,050 in FY 1997 (Wyoming Taxpayers Association, 1997). The Town of Big Piney also experienced unexpectedly high revenues in FY 1997. The FY 1997 General Fund totaled $346,096. Sales and use taxes comprised 57 percent of this total ($197,000). Mineral revenue-sharing from the state contributed 23 percent ($80,785), and property taxes provided 3.6 percent ($12,528).

Big Piney's projected FY 1998 budget is $245,205. Mineral tax revenue-sharing from the state contributes 29 percent ($71,700) to the town's estimated General Fund in this fiscal year. Projected mineral royalty distributions total $53,700, and severance taxes provide an additional $18,000 (Brown, 1998).

Big Piney's General Fund is allocated between administrative, airport, capital expenditures, fire department, government buildings, health and safety, legislative, municipal court, parks, police, social services, and streets. The amount received by each spending category is determined by the Town Council.

Marbleton. The municipal valuation of Marbleton increased 4.1 percent between 1996 ($1,738,380) and 1997 ($1,809,121). Municipal property taxes totaled $28,973 in FY 1997 (Wyoming Taxpayers Association, 1997). The General Fund for the Town of Marbleton totaled $470,857 in FY 1997. Sales and use taxes comprised 54 percent ($255,727). Mineral tax revenue sharing contributed another 22 percent, with mineral royalty distributions totaling $76,000 and severance taxes totaling $29,000.

Marbleton's projected FY 1998 budget is $406,138. Mineral tax revenue-sharing contributes 26 percent ($106,717) to the town's estimated General Fund. Estimated mineral royalty distributions total $72,000, with severance taxes providing an additional $34,717 (Griggs, 1998).

3.6 Transportation

The RMP states that BLM will manage transportation in the PAPA to *provide for identified transportation system needs through the development of a transportation plan in cooperation with Federal, State, County and local agencies.*

The existing system of roadways in southwest Wyoming is oriented to through-traffic and access between the widely dispersed population centers. All access to the PAPA would utilize U.S. Highways 189 and 191 and State Highway 351.

Equipment from either Denver or Salt Lake City would originate on Interstate 80 (I-80). Traffic from Salt Lake City would exit I-80 near Evanston, Wyoming to U.S. Highway 189. Traffic from Denver would exit I-80 at Rock Springs on U.S. Highway 191. State Highway 351 may also be used for traffic moving east-west between U.S. Highways 189 and 191 within the PAPA. Table 3-12 provides the recorded daily vehicle miles for U.S. Highway 191 and State Highway 351 during the years 1995 through 1997. In general, traffic volume showed only minor change between 1995 and 1997.

On U.S. Highway 191 between Rock Springs and Daniel, there were 368 accidents reported by the Wyoming Transportation Department for the period of 1993 through 1997 (Lucero, 1998). Animal collision (114) and overturn accidents (70) are heavily represented (over 50 percent) and almost half of the reported accidents occurred between mileposts 80.01 and 110.47. There were 91 collisions with other motor vehicles. Over half of the accidents occurred on clear days with dry roads. One hundred and thirteen of the accidents involved injuries; 9 of the accidents resulted in 10 fatalities.

Table 3-12
Average Number of Existing Vehicles Per Day on Highways Used to Access the Project Area

Road Segment	1995		1996		1997	
	All Vehicles	Trucks	All Vehicles	Trucks	All Vehicles	Trucks
U.S. Highway 191						
JCT Farson Cutoff Road to JCT County Road East (MP 41.956 to MP 42.456)	1530	175	1330	160	1330	160
JCT County Road East to JCT Eden Valley Reservoir Road (MP 42.456 to MP 49.056)	1460	165	1260	150	1200	130
JCT Eden Valley Reservoir Road to Sweetwater-Sublette County Line (MP 49.056 to MP 51.615)	1400	145	1200	130	1200	130
Sweetwater-Sublette County Line to JCT Old US 187 (MP 51.615 to MP 62.606)	1400	145	1200	130	1200	130
JCT Old US 187 to JCT Old US 187 (MP 62.606 to MP 69.106)	1410	145	1200	130	1200	130
JCT Old US 187 to JCT Speedway Road (MP 69.106 to MP 72.806)	1410	145	1200	130	1200	130
JCT Speedway Road to JCT WYO 351) (MP 72.806 to MP 76.752)	1400	145	1200	130	1200	130
JCT WYO 351 to JCT Fish Hatchery Road (MP 76.752 to MP 84.504)	1380	130	1100	120	1100	120
JCT Fish Hatchery Road to JCT WYO 353 (MP 84.504 to MP 87.802)	1300	130	1050	120	1050	120
JCT WYO 353 to JCT Wenz Airport Road (MP 87.802 to MP 92.802)	1550	150	1450	140	1450	140
JCT Wenz Airport Road to JCT County Roads East & West (MP 92.802 to MP 95.502)	1600	165	1500	150	1530	150
JCT County Roads East & West to JCT County Road East (MP 95.502 to MP 98.502)	1650	165	1550	150	1550	150
JCT County Road East to Pinedale South Corp Limits (MP 98.502 to MP 98.987)	1860	180	1800	170	1800	170
Pinedale South Corp Limits to JCT Fremont Lake Road (MP 98.987 to MP 99.385)	2860	200	2860	190	2900	190
JCT Fremont Lake Road to Pinedale West Corp Limits (MP 99.385 to MP 100.270)	4400	225	4350	210	4400	210
Pinedale West Corp Limits to JCT County Road North (MP 100.270 to MP 101.027)	2810	200	2760	190	2800	190
JCT County Road North to JCT SH 352 (MP 101.027 to MP 105.532)	2180	210	2130	200	2200	200
JCT SH 352 to JCT County Road South (MP 105.532 to MP 106.962)	1790	205	1740	200	1780	200
JCT County Road South to JCT U.S. 189 (MP 106.962 to MP 110.467)	1700	200	1650	200	1680	200
State Highway 351						
JCT U.S. Highway 189 to JCT County Road North (MP 0.000 to MP 12.913)	320	45	270	45	400	45
JCT County Road North to JCT U.S. Highway 191 (MP 12.913 to MP 24.181)	220	30	170	30	250	30

Wyoming Department of Transportation, 1997 and 1998.

On U.S. Highway 189 between Evanston and Daniel, there were 433 accidents for the period of 1993 through 1997 (Lucero, 1998). More than twice as many accidents occurred between milepost 30.01 and 40.00 (near Kemmerer) than at any other milepost . Of the 433 recorded accidents, 76 were overturns, 34 were collisions with other motor vehicles and 123 involved animals. The majority (approximately 70 percent) of the accidents occurred on clear days with dry roads. One hundred twenty eight of the accidents resulted in injuries; 10 of the accidents resulted in 12 total fatalities.

On State Highway 351 between U.S. Highways 189 and 191, there were 19 recorded accidents between 1993 and 1997 (Lucero, 1998). Five of the accidents were overturns, 8 involved animals and there was only 1 motor vehicle collision with another motor vehicle. All but 2 occurred on clear days with dry road conditions. Six of the accidents involved injuries and 1 accident resulted in 1 fatality.

Currently, access roads within the project area are limited to a few county roads, BLM roads, those roads installed by the operators to access existing wells and a number of two-track roads (see Figure 3-3). Sublette County is currently responsible for maintenance of the county roads. The operators are responsible for maintenance of improved roads on Federal lands.

The southern part of the PAPA is served by the Burma, Boulder South and Luman roads. In addition, the operators recently completed construction of another road that ties the south end of the project area to the Jonah II Field and creates new access from the Jonah II Field to State Highway 351. This is referred to as the Jonah North Road.

The north portion of the project area is currently served by the Mesa Road, East Green River Road and Paradise Road. The Pinedale South Road (Twin Bridges Road) is also used by the operators and connects the Mesa Road to the Town of Pinedale.

On August 18, 1999, the Pinedale Town Council held a meeting to discuss gas field traffic concerns within the town. Residents of the Town of Pinedale expressed great concern and opposition to operator use of Tyler Avenue as an access route to the north end of the project area. Residents of Pinedale and Tyler Avenue made the comment that the road has become a disaster. Truck traffic occurs 24 hours a day; dust is high (even though the road is being watered); and speed is excessive. Tyler Avenue has been used for recreation such as walking, jogging and biking, but is no longer used for this purpose because it is unsafe and dusty.

Traffic counter information gathered by the Town of Pinedale and Sublette County showed the following use:

August 12 - 15, 1999 (1 p.m. to 1 p.m.)	
Tyler Avenue (within town limits)	2,080 vehicles
Twin Bridges Road (County Road)	1,329 vehicles
August 16 - 18, 1999 (1 p.m. to 1 p.m.)	
Tyler Avenue (within town limits)	1,141 vehicles
Twin Bridges Road (County Road)	684 vehicles

The traffic counter information shows that about 62.5 percent of the traffic is going to or coming from the area south of Pinedale Town Limits (i.e., the Mesa and/or the two Anschutz wells being drilled between Pinedale and the Mesa). The concerned residents of Pinedale were adamant that an alternate route be identified. It was suggested that a road be constructed between the industrial park (west of Pinedale) and the Twin Bridges Road. This would eliminate the Tyler Avenue problem.

Also, concern and complaints were expressed by residents along the Green River Road (County Road 23-110) and the Boulder South Road (County Road 23-106) regarding high levels of dust and road degradation due to gas field traffic.

3.7 Land Use/Residential Areas

3.7.1 RMP Management Objective. The land and realty management objective contained in the Pinedale RMP is to *provide land use authorizations in support of public needs. This is to be done in consideration of and in compliance with the various management decisions, goals, objectives, and resource restrictions required to protect or maintain the multiple uses and resource values as described in the approved Pinedale RMP. The right to occupy or acquire public lands will be authorized under the appropriate realty actions within a multiple use management concept and within the objectives and guidance provided under all resources.*

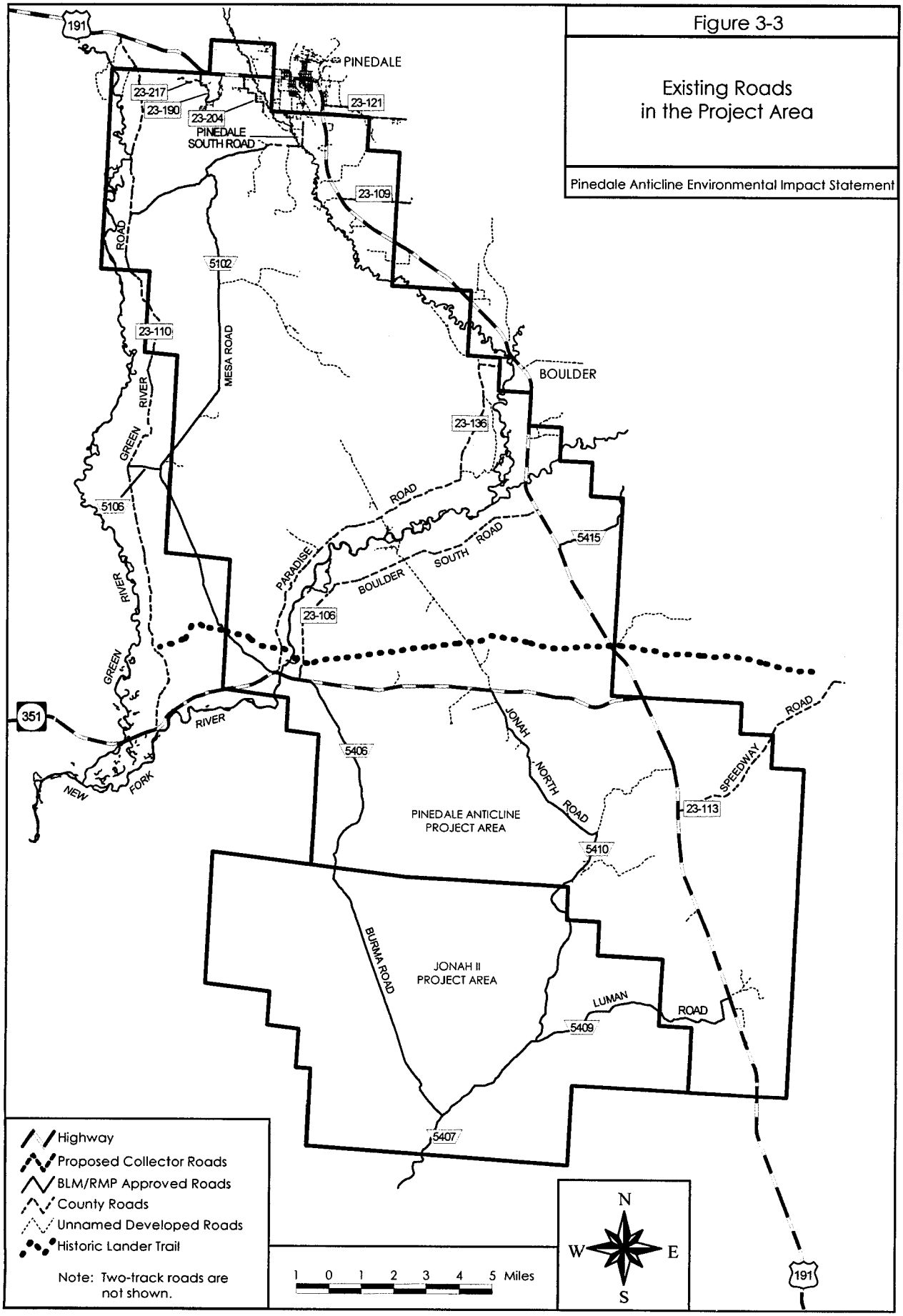


Figure 3-3
Existing Roads in the Project Area
Pinedale Anticline Environmental Impact Statement
191
PINEDALE
23-217
23-190
23-204
PINEDALE SOUTH ROAD
23-121
23-109
ROAD
5102
MESA ROAD
23-110
RIVER
GREEN
BOULDER
23-136
ROAD
5106
PARADISE
BOULDER SOUTH ROAD
5415
RIVER
GREEN
23-106
351
RIVER
NEW FORK
5406
JONAH NORTH ROAD
ROAD
SPEEDWAY
23-113
PINEDALE ANTICLINE PROJECT AREA
5410
BURMA ROAD
JONAH II PROJECT AREA
LUMAN ROAD
5409
5407
191
Highway
Proposed Collector Roads
BLM/RMP Approved Roads
County Roads
Unnamed Developed Roads
Historic Lander Trail
Note: Two-track roads are not shown.
1 0 1 2 3 4 5 Miles
N
W
E
S

3.7.2 Affected Environment. Land use within the PAPA was determined using land use/land cover mapping coverages available from the U.S. Geological Survey (USGS). While the coverage types are broad in nature, they none-the-less provide a good understanding of the types and extent of land uses that occur in the project area. Table 3-13 lists the acreage of land use types in the project area. Land use, based on the USGS coverage, is shown on Figure 3-4.

Table 3-13
Land Use/Land Cover in the Project Area

Land Use/Land Cover Type	Acres	Percent
Cropland and Pasture	7,569	3.83
Forested Wetlands	1,537	0.78
Herbaceous Rangeland	852	0.43
Industrial	70	0.04
Mixed Rangeland	6,256	3.17
Nonforested Wetlands	8,933	4.53
Reservoirs	23	0.01
Residential	179	0.09
Sandy Areas Other than Beaches	96	0.05
Shrub and Brush Rangeland	171,407	86.86
Strip Mines, Quarries, and Gravel Pits	166	0.08
Transitional Areas	32	0.02
Transportation, Communications	225	0.11
Total	197,345	100

The predominant land use in the project area is rangeland (mixed and shrub and brush dominated). Approximately 178,500 acres (or nearly 90 percent of the project area) consists of this land use type. The next most common land use type is nonforested wetlands, which includes much of the flood plains. Nonforested wetlands occupy about 4.5 percent of the lands in the project area. A more detailed discussion of wetlands is provided later in this chapter.

Sublette County Zoning. In 1978, Sublette County adopted zoning and development regulations. These regulations have been amended numerous times. Chapter I of those regulations state that the purpose is to "*protect public health, safety and general welfare*" and to provide for "*orderly and well planned development within the county, and preventing random development which is incompatible with existing and historic land uses*". The regulations are designed, in part, to further the appropriate use of land and the conservation of natural resources, isolate and control unavoidable nuisance-producing uses, and foster the state's agricultural, mineral, recreational and other industries. The regulations (Chapter 1, Section 5) allow for more restrictive requirements than imposed by Wyoming statute.

The regulations apply to all unincorporated lands within the county. Basically, the regulations establish zoning districts in the county which are designated based on their primary use. The zones listed on Table 3-14 have been defined in the PAPA.

Table 3-14
Sublette County Zoning Districts in the Project Area

Zoning District	Acres	Percent of Project Area
Agricultural	46,387	23.5
Highway commercial	32	< 0.1
Heavy industrial	37	< 0.1
Light industrial	456	0.2
Rural residential	1392	0.7
Rural residential 10	366	0.2
Rural residential 20	166	0.1
Rural residential 5	127	0.1
Rural residential mobile/manufactured home 10	34	< 0.1
Resource conservation	148,332	75.2
Rural mixed	16	< 0.1
Total	197,345	100

Descriptions of these zones are provided below:

Agricultural. This district maintains and continues the existing agricultural land use in the county.

Highway Commercial. This district provides for orderly and compact highway related commercial development.

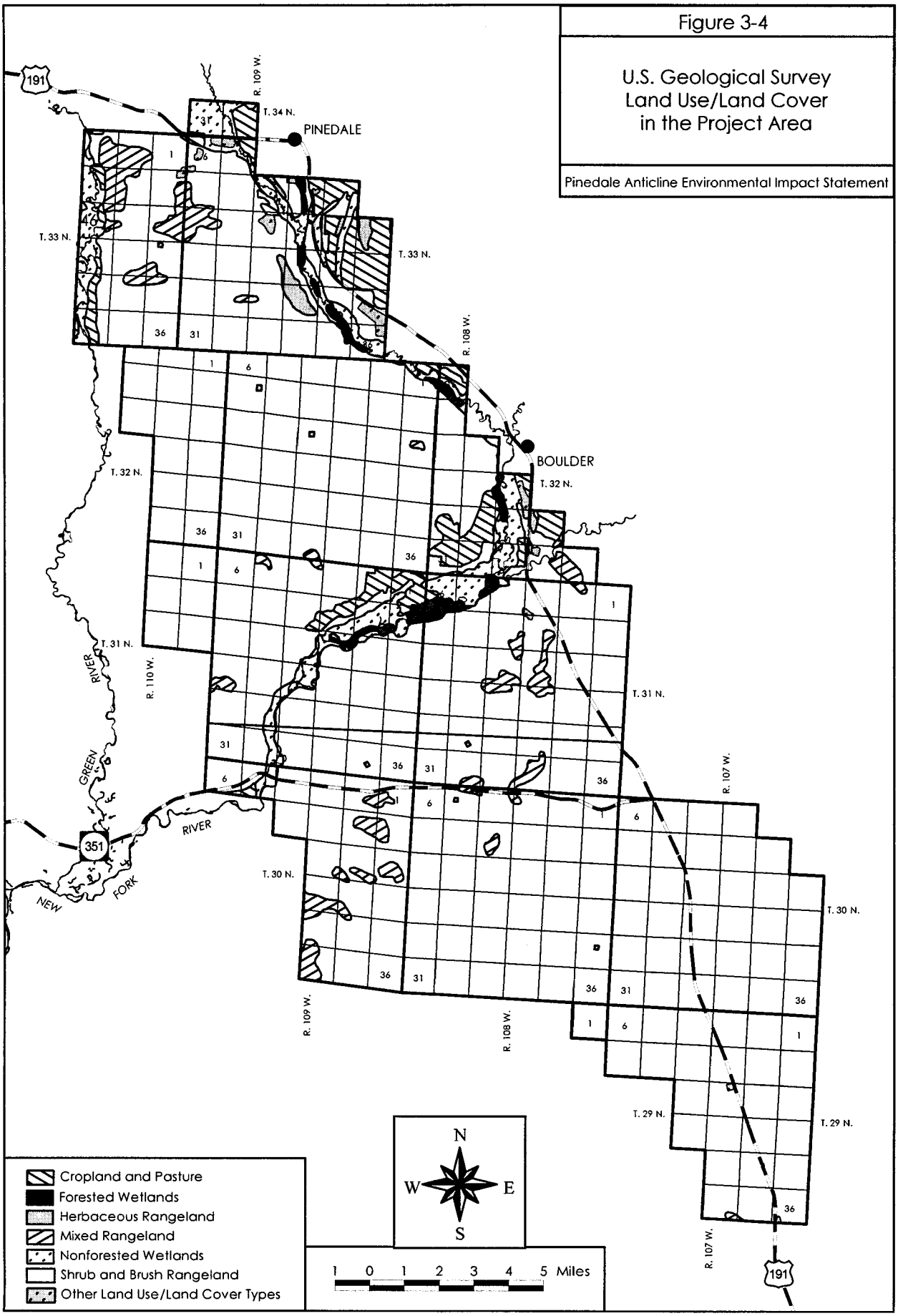
Heavy Industrial. This district provides for general industrial uses.

Light Industrial. This district provides for safe, non-nuisance causing industrial uses.

Figure 3-4

U.S. Geological Survey
Land Use/Land Cover
in the Project Area

Pinedale Anticline Environmental Impact Statement



Rural Residential. This district provides areas in the rural portions of the county for residential development and uses.

Rural Residential 10. This district provides areas in the rural portions of the county for residential development and uses. A ten acre minimum parcel is required.

Rural Residential 20. This district provides areas in the rural portions of the county for residential development and uses. A twenty acre minimum parcel is required.

Rural Residential 5. This district provides areas in the rural portions of the county for residential development and uses. A 5 acre minimum parcel is required.

Rural Residential Mobile/Manufactured Home 10. This district provides areas in the rural portions of the county for residential and/or mobile/manufactured home development and uses.

Resource Conservation. This district protects and conserves environmentally sensitive areas where development must be limited to prevent degradation of the areas. Most of the area designated as resource conservation within the PAPA is Federal lands and minerals.

Rural Mixed. This district provides land for a mixture of uses which are compatible to the residents of the district and adjoining property owners.

Figure 3-5 shows the current county zoning districts for all lands in the project area.

Chapter II of the regulations state that mining and mineral extraction are authorized in all the zoning districts, as long as they conform to the applicable development standards and conform to the applicable goals, policies and guidelines of the Sublette County Comprehensive Plan. However, the regulations specifically exclude oil and gas development from the definition of mining. Therefore, oil and gas development is not considered an authorized use in all the zoning districts.

Chapter III of the regulations provides development standards to which all proposed uses and structures must comply. Section 10 of that chapter provides slope and soil suitability standards. Those standards prohibit any development in any zoning district on any site with a slope in excess of 30 percent or on any slump area. Further, the standard restricts construction of roads across slopes in excess of 30 percent or slump areas unless no other access to the site is available and the road meets erosion control and restoration guidelines. The regulation further requires that all development on slopes between 8 and 30 percent be planned and constructed to prevent erosion and excessive storm water or snowmelt runoff and to minimize disruption of soils and vegetation.

Section 12 provides drainage standards. The regulations require that all development and site improvements be designed and constructed to minimize disruption of natural drainage, minimize surface runoff onto adjacent watercourse or properties and maximize percolation and infiltration into the ground.

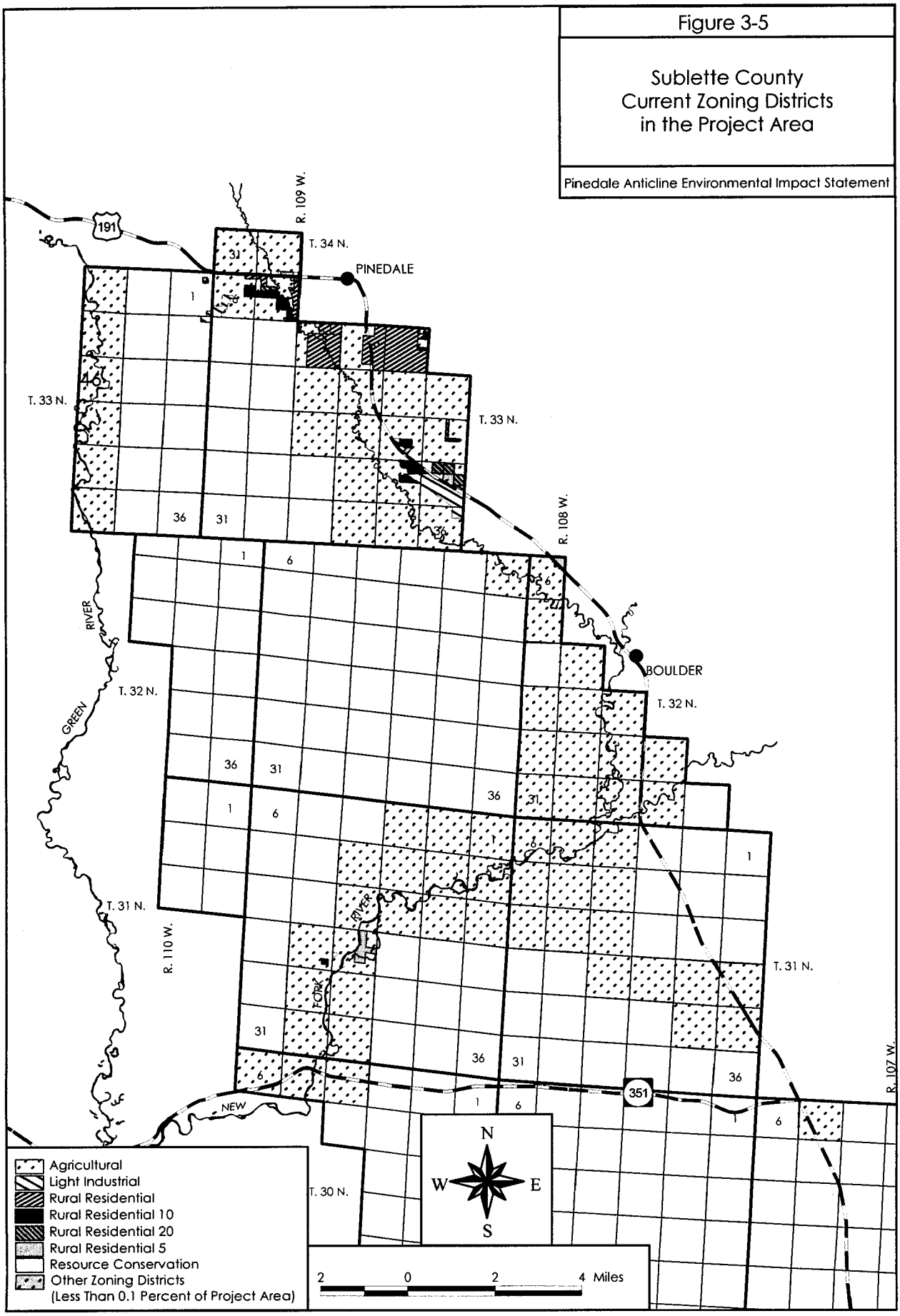
The final development standards of interest are found in Sections 14 and 16. These sections address odors and noise. Section 14 states that no use *"shall be operated so that noise resulting from said use is perceptible beyond the boundaries of the property"* (temporary construction noise is excluded). Section 16 prohibits the discharge of unreasonable or objectionable odors beyond the boundaries of the site.

Residential Areas and Subdivisions. During scoping for this project, a number of comments were received which suggested a "no-drilling" buffer around houses and the Town of Pinedale. One comment suggested that no development occur within 5 miles of Pinedale. As is shown on Figure 3-5, a small portion of the project area has been zoned by Sublette County for residential use. These areas include the rural residential, rural residential 10, rural residential 20, rural residential 5 and rural residential mobile/manufactured home 10 zoning districts listed on Table 3-14. Combined, areas which have been zoned for residential use occupy only about 2,085 acres or about 1 percent of the entire PAPA. In addition, a number of the areas in the PAPA have been subdivided. According to GIS data provided by Sublette County, there are 32 subdivided areas that partially overlap the project area. These areas are shown on Figure 3-6 and are listed on Table 3-15.

Figure 3-5

Sublette County
Current Zoning Districts
in the Project Area

Pinedale Anticline Environmental Impact Statement



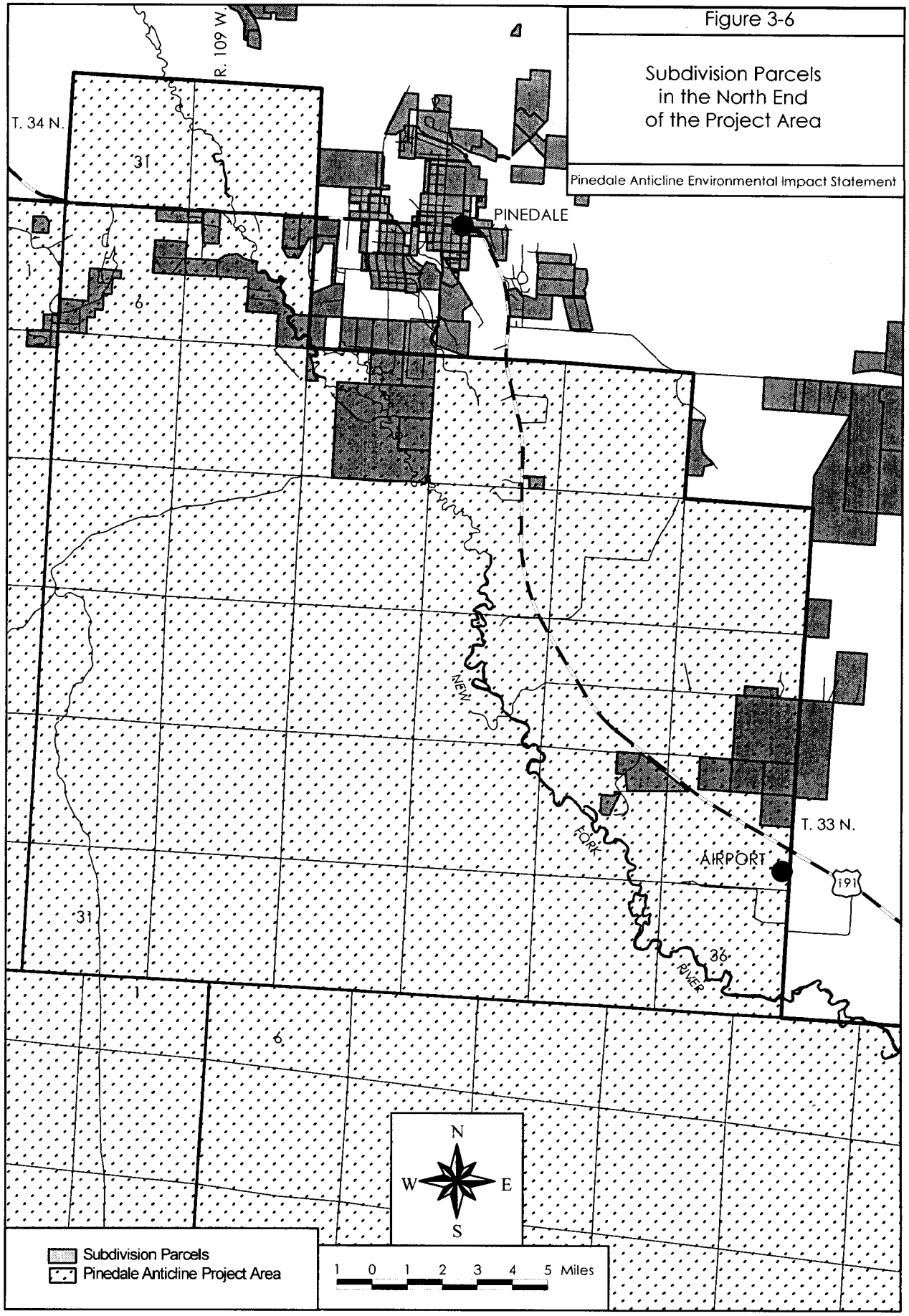


Figure 3-6

Subdivision Parcels in the North End of the Project Area

Pinedale Anticline Environmental Impact Statement

Table 3-15
Subdivisions in the Project Area

Subdivision Name	Type	Year	Acres in PAPA
Wild Horse Ranch	Subdivision	1980	122
Big Country Ranches Fourth Filing Unit C	Subdivision	1979	33.3
Half Moon Mountain Fourth	Subdivision	1978	1
Big Country Ranches Fourth Filing Unit A	Subdivision	1978	0.3
Airport	Subdivision	1978	76.6
Bridle Bit Ranches	Large Tract Development	1996	161.5
Beck	Subdivision	1991	12.5
Scenic View	Subdivision	1980	40.4
Rocky Roads	Subdivision	1978	0.1
South Forty	Subdivision	1984	40.4
Thirty-three (33) Ranch	Subdivision	1992	0.1
Redstone New Fork River	Subdivision	1977	175
New Fork Social Club	Subdivision	1979	324.1
Swingers Green 2nd	Subdivision	1983	15.7
Bloom	Subdivision	1962	20.4
Valley Hills	Subdivision	1978	21.1
Giebel	Subdivision	1977	7.3
Wind River Peaks	Subdivision	1996	0.1
Burt	Lot Division	1996	40.3
Agostini	Lot Division	1996	40.4
Scout's View	Large Tract Development	1996	162
Haymeadow	Lot Division	1991	0.2
Willow	Lot Division	1989	0.2
Tad/shaffer	Lot Division	1993	16.3
Mullett	Lot Division	1995	19.1
Merritt, Harold	Lot Division	1995	10.1
New Fork Social Club Second	Lot Division	1992	40.6
Allan	Lot Division	1995	40.4
Orvie E. Berg	Lot Division	1985	0.7
Hicks	Lot Division	1947	5.5
Hopkins	Lot Division	1998	2.2
Industrial Site	Subdivision	1973	99.9
Total			1,529.8

Combined, the subdivided areas encompass approximately 1,530 acres. Most are concentrated on the north end of the project area near Pinedale and the airport.

The portion of the project area within 0.25 miles of existing residences, areas zoned primarily for residential use, and around portions of the project area which have been subdivided for residential use comprises the Residential SRMZ. The Residential SRMZ is shown on Figure 3-7. In most cases, the minerals have been leased by the operators under the Residential SRMZ. However, in many portions of the Residential SRMZ, the owner of the residence or subdivision parcel is not the owner of the mineral. The residential SRMZ occupies an area of 10,280 acres or about 5 percent of the project area.

3.8 Recreation Resources

3.8.1 RMP Management Objective. The RMP objective for recreation is: *recreation values will be managed to accommodate existing uses, prevent or mitigate environmental degradation resulting from recreation and other uses, and provide for the anticipated recreation uses and use levels in the resource area.*

The RMP places management emphasis on the current recreation management areas including the Green and New Fork rivers and Oregon Trail routes. Specifically, the RMP requires that recreation management of these sites emphasize maintaining or improving the quality of the sites and the recreation experience. The RMP requires Federal lands along the Green and New Fork rivers to be managed to provide fishing and floating opportunities.

3.8.2 Recreation Activities. The University of Wyoming (1997) recently summarized recreation use in the Pinedale Resource Area. Data from the University's study was summarized from BLM's Recreation Management Information System (RMIS). In 1995, RMIS reported 754,000 individual recreation days on BLM-managed lands in southwest Wyoming. Of this total, 12.9 percent (or about 97,000 recreation days) occurred in the Pinedale Resource Area. According to the RMIS data, recreation days within the Pinedale Resource Area were distributed among activities as shown on Table 3-16.

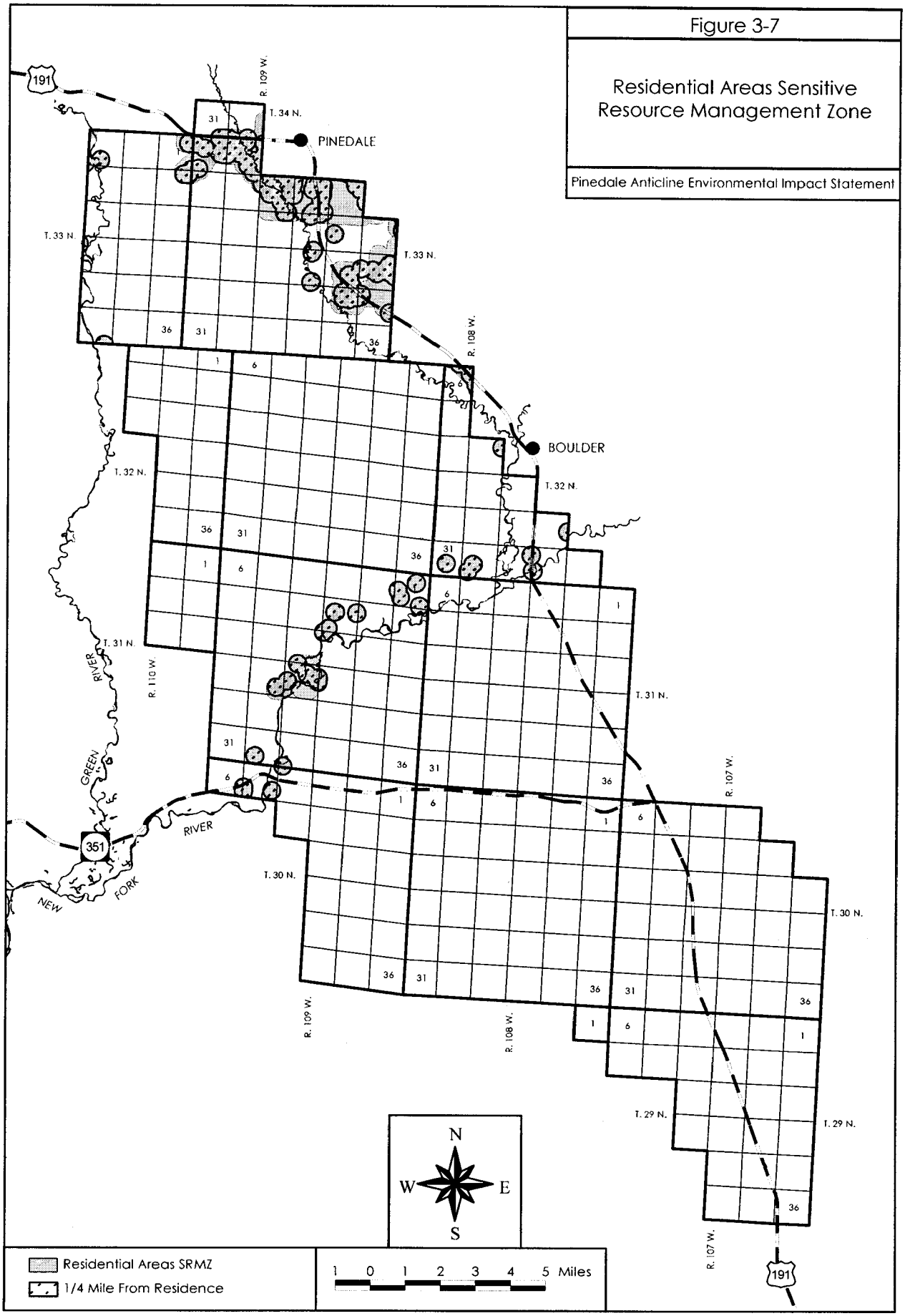


Figure 3-7
Residential Areas Sensitive Resource Management Zone
Pinedale Anticline Environmental Impact Statement
191
PINEDALE
BOULDER
T. 34 N.
T. 33 N.
T. 32 N.
T. 31 N.
T. 30 N.
T. 29 N.
R. 109 W.
R. 108 W.
R. 107 W.
R. 110 W.
GREEN RIVER
NEW FORK RIVER
351
N
W
E
S
Residential Areas SRMZ
1/4 Mile From Residence
1 0 1 2 3 4 5 Miles

Table 3-16 Recreation Use Days in the Pinedale Resource Area During 1995	
Activity	**Recreation Days**
Big game hunting	15,388
Camping	20,400
Motorized travel	4,974
Fishing	8,141
Nonmotorized travel	16,878
Driving for pleasure	4,457
Other land activities	1,667
Nonmotorized boating	21,965
Viewing wildlife	314
Other hunting	269
Snowmobiling	2,252
Nonmotorized winter sports	684
Motorized boating	19
Miscellaneous water activity	121

Most recreation use in the PAPA is related to fishing on the New Fork and Green rivers, and hunting throughout the project area. An increase in commercial guiding has occurred. Currently there are 20 to 30 commercial outfitters permitted for the Green/New Fork/Mesa area. Dispersed recreation use occurs throughout the project area (particularly in areas adjacent to Pinedale). Big game hunting within the PAPA includes antelope, mule deer and moose. A variety of bird species are hunted within the PAPA including ducks, geese and sage grouse. Winter viewing of mule deer on winter range in the PAPA is a unique recreational activity. Although viewing deer on winter range occurs elsewhere, it is limited to areas that have good all weather roads. Because of the accessibility to Pinedale , the Mesa has historically been a popular area for viewing deer in the winter. Other dispersed recreational activities in the PAPA include small game hunting, hiking, river rafting and canoeing, off-road vehicle (ORV) use, snowmobiling, mountain biking, horseback riding, cross country skiing, sight seeing of historic trails, wildlife viewing and antler collection in the spring. As the community grows, the need for dispersed recreation will increase in the project area.

The BLM does not have any recorded data on recreation use for the PAPA. However, during public scoping a number of local residents indicated that the public lands within the PAPA, especially at the north end near Pinedale, are used regularly for recreation because of their convenient location. Federal lands adjacent to residential areas in the north end of the PAPA are included in the Recreation SRMZ (see Section 4.7.3.1).

3.8.3 Recreation Sites and Facilities. Both the New Fork and Green rivers flow through the PAPA. WGFD's Basin Management Plans include 3 stream segments on the New Fork River and 1 on the Green River that flow through the PAPA (see Table 3-17). The 3 stream segments for the New Fork River include (starting with the downstream end and working upstream): from the Green River to East Fork River; East Fork River to Pine Creek and Pine Creek to New Fork Lake. The Green River segment is from the New Fork River to Warren Bridge.

Table 3-17 New Fork River and Green River Angling Pressure Within the Project Area			
Stream Segment	**Stream Class**	**Primary Species**	**Angling Pressure (days/year)**
New Fork River			
Green River to East Fork River	3	BNT, RBT, KOE, SRC, WF	3,200
East Fork River to Pine Creek	2	BNT, RBT, WF	2,700
Pine Creek to New Fork Lake	3	BNT, RBT	700
Green River			
New Fork River to Warren Bridge	3	BNT, RBT	3,000
Stream class: 1 - outstanding trout waters of national importance; 2 - very good trout waters with fisheries of statewide importance; 3 - important trout waters with fisheries of regional importance. BNT - brown trout, RBT- rainbow trout, SRC - Snake River cutthroat trout, KOE- kokanee, WF- whitefish.			

There are a few developed recreation facilities and sites located in the PAPA (see Figure 3-8). There are 2 developed WGFD river access site in the project area. One is located on the Mesa Road where it crosses the New Fork River near Pinedale. The other is the Pinedale Float Access located in Section 36, T. 33 N., R. 109 W. near the airport. Another developed WGFD site is located immediately adjacent to the PAPA on the New Fork River near Boulder where Paradise Road crosses the New Fork River. Five undeveloped river access sites occur on

Figure 3-8

Public Recreation Sites and ORV Designations in the Project Area

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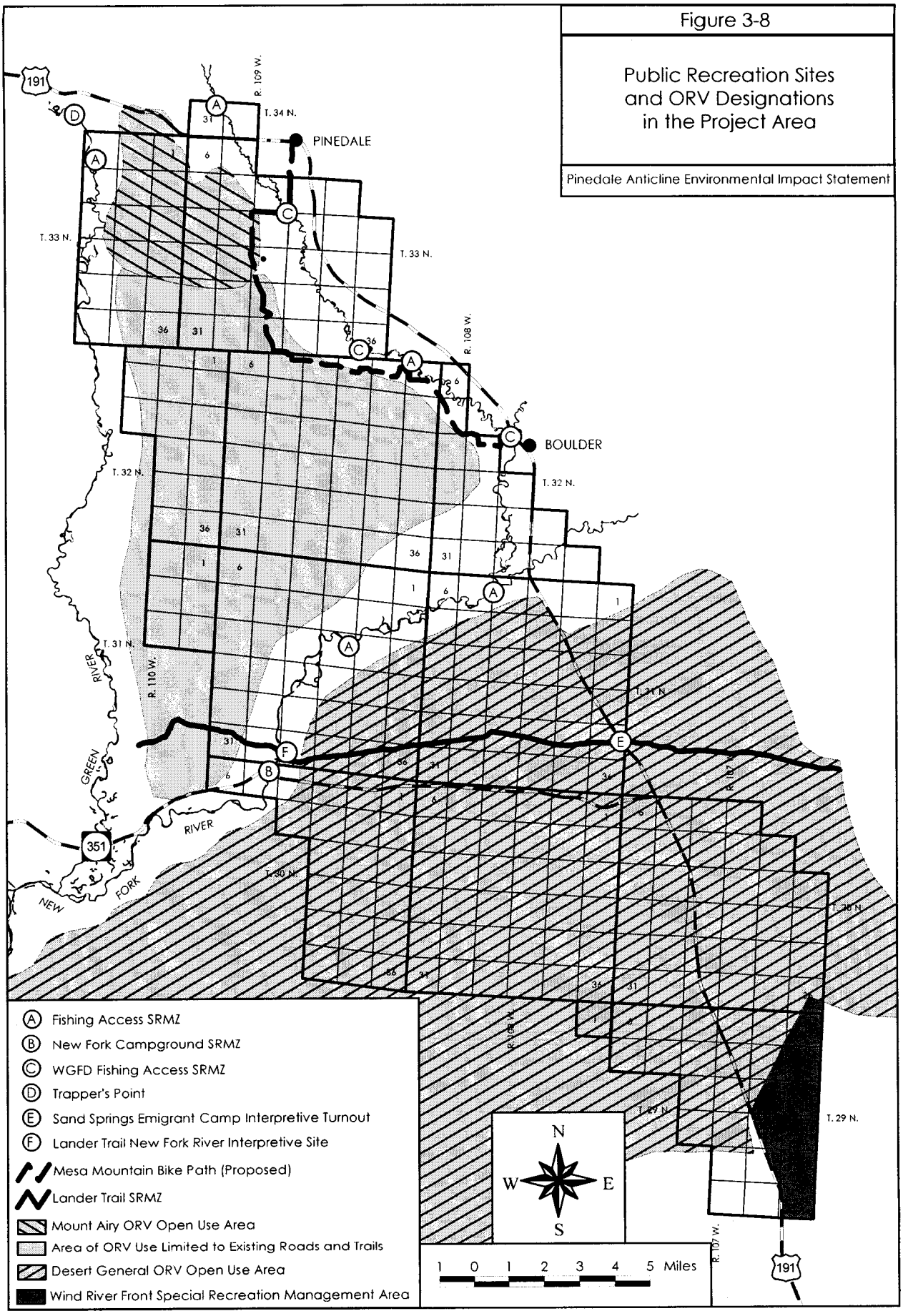

Federal lands in the project area. Four of these sites are on the New Fork River and 1 is on the Green River. One BLM recreation site, the New Fork Campground (located in Section 5, T. 30 N., R. 109 W.), is located in the project area. This developed campsite is located on State Highway 351 where it crosses the New Fork River. Access to the river is provided at this site. The developments at this site consist of 5 campsites, a vault toilet, a hand pump well, picnic tables and trash cans. The area within 0.25 miles of each of these recreation sites is included in the Recreation SRMZ.

In the past, the BLM proposed to construct the Mesa Mountain Bike Path. The bike path would be located almost entirely within the PAPA (see Figure 3-8). The bike path would follow 15 miles of existing roads and two-tracks from Pinedale to Boulder. Portions of the original route may now be inappropriate because of existing oil and gas development. BLM is continuing with plans to complete the Mesa Mountain bike path.

A large area in the north end of the PAPA near Mount Airy was identified in the Pinedale RMP as a potential ORV use area (see Figure 3-8). The RMP stated that the Mount Airy ORV Use Area was to be established to provide intensive use for ORVs. Although the area shows signs of recent ORV use, it has so far not been subjected to extensive use. The Pinedale RMP allows the legitimate use of ORVs where possible, while providing adequate protection of identified sensitive resources. Generally, the area south of the New Fork River is designated in the RMP as a general ORV open area and is open year-round to ORV use. On the Mesa, the RMP restricts travel during the winter to protect deer and antelope on winter ranges and limits other travel to existing roads and trails. However, in both of these areas, ORV travel can occur anywhere (i.e., is not limited to only existing roads and trails).

Portions of the PAPA occur within WGFD's antelope, mule deer, moose and elk hunt areas. Table 3-18 provides, for each hunt area, the number of hunters and their success rate for the 1997 hunting season (McWhirter, 1998a and 1998b). Although 2 elk herd units (HU) overlap the PAPA, elk in the Pinedale HU do not occupy any seasonal ranges in the project area. The only occupied elk range coincides with the northern-most 2 sections of the PAPA (T. 34 N.), north of U.S. Highway 191 between Pinedale and Daniel. Limited hunting opportunities exist in these sections.

3.8.4 Wilderness. The closest wilderness to the PAPA is the Bridger Wilderness Area (see Figure 1-1) which is approximately 9 miles east of the PAPA at its closest point. The Fitzpatrick and Popo Agie Wilderness areas border the eastern boundary of the Bridger Wilderness Area along the Continental Divide. The Scab Creek Wilderness Study Area, which has been recommended by the BLM for designation as a new wilderness, is located south of Boulder Lake, approximately 7 miles east of the project area.

3.8.5 National Natural Landmarks. No designated landmarks occur within the PAPA, however, the Pinedale Glacial Fields and Fremont Lake, which are located approximately 2.3 miles northeast of the PAPA, were recommended by the National Park Service (1976) to be studied for preservation as a natural landmark. The glacial fields are examples of land sculpturing by glaciers. The moraines provide habitat for several plant species not commonly encountered in the Wyoming Basin (e.g., blue spruce, water birch, raspberry and baneberry).

3.8.6 Wild and Scenic Rivers. The Green River from Warren Bridge to its source has been identified on the National Rivers Inventory by the National Park Service (NPS) as a potential wild and scenic river. This river segment is located approximately 14 miles northwest of the PAPA. A 19-mile segment of the river from Warren Bridge to the USFS boundary is managed by the BLM as a Special Recreation Management Area.

3.8.7 Lander Trail. A recreation opportunity in the project area is the Lander Trail, a segment of the National Historic Trail System. The location of the trail through the PAPA is shown on Figure 3-8. Typically, the public knows the trail primarily as a historical resource. Recreation uses of the trail include local use by residents of Sublette County, tours of the trail by non-residents and seasonal use by school groups. Although BLM has not monitored recreation use on this segment of the trail, it is estimated that there may be as many as 1,000 visitor days annually on the trail segment in the PAPA. Given the tourist traffic traveling on U.S. Highway 191, coupled with the Sand Springs emmigrant camp

Table 3-18
Big Game Populations, Hunt Area Harvest and Occupied Seasonal Ranges Coinciding with the Project Area

Big Game Species	Population Herd Unit	Post-Harvest Population Objective	1997 Post-Harvest Population Estimate	Apparent Population Trend	Hunt Area	1997 Harvest in Hunt Area
Pronghorn	Sublette North Unit only	22,000	18,100	Slightly Increasing	87	261
					90	343
Mule Deer	Sublette	32,000	24,700	Slightly Increasing	138	53
					139	41
					140	9
Moose	Sublette	5,500	5,500	Stable	4	40
Elk	Upper Green River	2,500	2,800	Increasing	96	206
	Pinedale	1,900	2,250	Decreasing	97	220
					98	322

interpretive turnout and signing, on the way to the parks, the trail could attract significant use. However, most of the traveling public is unaware of the unique opportunity that awaits a short distance off the highway. Improvements at the Sand Spring site (vault toilet and dumpster), an expanded interpretive kiosk and development of a walking/driving historic route (in cooperation with the private landowner), could expand the public's enjoyment of this resource.

3.8.8 Wind River Front Special Recreation Management Area. A portion (5,122 acres) of the southeastern part of the project area overlaps this special recreation management area (SRMA). Generally, the SRMA includes the area east of U.S. Highway 191 in T. 29 N., R. 107 W. (see Figure 3-8). The Wind River Front SRMA is described as one of the most scenic and predominantly unmodified natural environments on a large scale in the BLM's Green River Resource Area. The area is relatively undisturbed affording the visitor an opportunity to experience isolation from the sights and sounds of other humans. The area provides a high degree of interaction with the natural environment and the recreation opportunities are considered substantial. The BLM, in the Green River RMP (BLM, 1992), recognized that there was interest in developing minerals in the western portion of the SRMA.

The portion of the SRMA in the project area is managed for dispersed recreation use with full consideration given to wildlife, cultural resources, vegetation, watershed values and mineral development activity. The entire western portion of the SRMA is open to mineral leasing. Transportation planning will be conducted with one goal being to reduce conflicts with recreation uses of the PAPA. Surface disturbing activities would be limited through controlled surface use requirements or closing areas where maximum resource protection is necessary. Facility placement would be designed for minimum surface disturbance unless a site-specific analysis determines that additional activity can occur and the SRMA objectives can be met. The Green River RMP contemplates that the operators and BLM could arrive at an acceptable mitigation plan and that such a plan would involve developing only a portion of the area coupled with no development in remaining areas. Other considerations for the plan which are specifically addressed in the RMP are pad drilling and remote operation of production facilities to limit trips into locations. The Wind River Front SRMA is included in the Recreation SRMZ for this project.

3.9 Visual Resources

3.9.1 RMP Management Objective. The RMP objective for visual resources is to *maintain overall integrity of visual resources while allowing for modification and changes to occur to meet other resource objectives.*

The RMP recognized that visual resource classification area boundaries were subject to change and further definition as more inventories and evaluations were conducted. Further, the RMP states that *"projects of all types within established VRM class areas will generally be required to conform with*

the objectives and characteristics of the classification, or the project will be modified in order to meet the VRM class objectives".

3.9.2. Affected Environment. The project area is dominated by sagebrush and high desert vegetation blending with extensive riparian areas and wetlands associated with the New Fork and Green river flood plains. Open space and solitude best describe the feeling one gets when traveling through most of the project area. Most of the area is inaccessible by vehicles and when one walks away from one of the few roads in the area it is difficult to find evidence of human activity. The views from most of the project area, particularly the Mesa, are exceptional. To the east is the Wind River Range and to the west the Wyoming Range. While some oil and gas development (i.e., well pads, production equipment, improved roads and both buried and surface pipelines) is present in the PAPA, the level of development is currently subordinate and does not dominate the landscape or views. Irrigated croplands and hay meadows occur along the privately-owned riparian areas along the New Fork and Green river flood plains and provide an open pastoral ranch setting. Residences are scattered along the river corridors in the PAPA as well as along U.S. Highway 191.

The Visual Resource Management (VRM) System is the basic tool used by the BLM to inventory and manage visual resources on public lands. The VRM classification combines an evaluation of visual quality, visual sensitivity of the area and view distances. The BLM's Pinedale Resource Area was first visually inventoried and classified in 1978.

VRM classes are used to identify the degree of acceptable visual change within a characteristic landscape. A class is based on the physical and sociological characteristics of a given homogeneous area and serves as a management objective. The objectives of the various BLM VRM classes which occur within the PAPA are described below:

Class II - The objective of this class is to retain the existing character of the landscape. The level of change to the character of the landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color and texture found in the predominant natural features of the characteristic landscape.

Class III - The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV - The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of the viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance and repeating the basic elements found in the predominant natural features of the characteristic landscape.

Figure 3-9 shows the location of the VRM classes in the project area. Although the 1988 RMP states that the VRM classifications are subject to change as more inventories and evaluations are conducted, such changes have not been made (i.e., inventories and evaluations have yet to be conducted). Such changes in the VRM classification are outside the scope of this EIS. Land use planning (RMP) changes to the VRM classification in the project area would involve the process, including public involvement, of conducting a formal reclassification which would lead to an update of the Pinedale RMP.

Table 3-19 lists the acreage of Federal lands and minerals in each of the VRM classes in the project area. The majority of the project area is considered VRM IV where major modifications to the existing character of the landscape are allowed. Class II areas are located primarily along the river flood plains (see Figure 3-9). As such, the current VRM Class II areas cover only a small part (3.1 percent) of the 165,420 acres of Federal lands and minerals in the project area.

During public scoping, a number of comments were received regarding the visual sensitivity of that

Figure 3-9

Visual Resource Management Classifications in the Project Area

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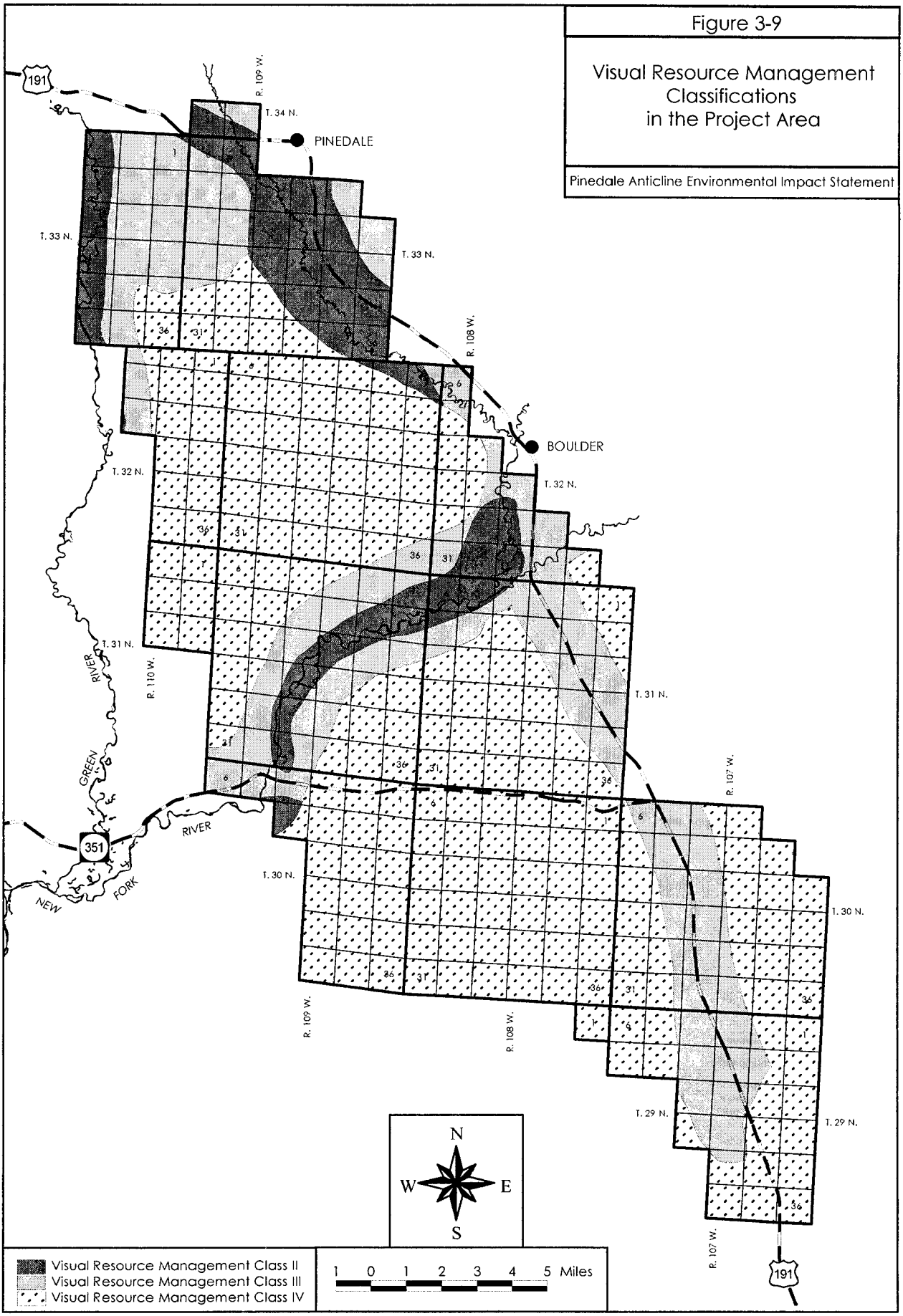


Table 3-19 Acreage of Federal Lands and Minerals in Each VRM Class in the Project Area	
VRM Class	Acres
VRM II	5,191
VRM III	40,159
VRM IV	120,070

portion of the project area that is visible from Pinedale and portions of U.S. Highway 191 leading into town. The majority of this area is classified as VRM II and III. To address this concern, a computer model was developed to determine the portions of the project area that are visible from 6 different view points scattered through the north end of the project area. These view points were selected as representative of areas adjacent to the project area which are sensitive of changes in the viewshed. The view points used to determine visibility are shown on Figure 3-10 and included:

- the Mountain Man Museum (SE/NW, Section 34, T. 34 N., R. 109 W.);
- the airport (NE/SE, Section 25, T. 33 N., R. 109 W.);
- along U.S. Highway 191 (SW/SE, Section 23, T. 33 N., R. 109 W.);
- along U.S. Highway 191 (SW/SE, Section 10, T. 33 N., R. 109 W.);
- southwest Pinedale (NW/SE, Section 4, T. 33 N., R. 109 W.); and
- along Orcutt Road (SW/NW, Section 34, T. 34 N., R. 109 W.).

Analysis was run for each point to determine the portion of the landscape in the PAPA that an average height (5'10") person would be able to see from that point. The same analyses were run again to determine where objects rising 10 feet and 25 feet above ground level would be visible to the average height person. Low-profile tanks are no more than 10 feet high; standard tanks and combustion chambers can be 25 feet high.

Elevation data for the analysis was obtained from the USGS and has a vertical accuracy of 23 feet or better. This data is the most accurate currently available and is the industry standard for this type of analysis.

The results of the visibility analysis are provided in Appendix G. Figure 3-10 shows the portions of the project area that are visible from the 6 view points when the view points are combined together. The area shown in Figure 3-10 represents the Sensitive Viewshed SRMZ for the project area. It includes all areas visible from the 6 points with the 25 feet above ground level criteria.

The sales pipeline corridor would cross areas designated at both VRM Class II and III along the Green River. However, construction would occur in an existing utility corridor that presently displays a high degree of visual contrast. The majority of the corridor crosses through areas managed for VRM Class IV.

3.10 Cultural and Historic Resources

3.10.1 RMP Management Objective. The Pinedale RMP requires that uses on public lands be managed to avoid damage to cultural resources including providing for appropriate mitigation of unavoidable impacts on cultural resources. As necessary, the RMP states that withdrawal from exploration and development of locatable minerals on significant cultural sites will be pursued. The RMP objective for cultural resources states *cultural resources will be managed to: 1) resolve conflicts between cultural resources and other resource uses; 2) provide appropriate levels of protection for significant cultural resources; 3) design cultural resources management actions to maintain the value of cultural resources; and 4) provide for the scientific and educational use of cultural resources.*

Cultural resources, which are considered under the National Historic Preservation Act of 1966 (NHPA), Native American Graves Protection and Repatriation Act, and the Archaeological Resources Protection Act of 1979 (ARPA), are the nonrenewable remains of past human activity. The archaeological record of the project area has been partially examined through surveys, test excavations, examination of ethnographic materials, consultation with modern Native American people, archival sources and the historic record. Euroamerican exploration and settlement in the area is understood by historic and archival records. The area is rich in prehistoric resources (though they are poorly understood) but also contains large quantities of historic period sites. The historic period sites predominantly relate to regional settlement, open range ranching, stock grazing, emigrant migration and wagon road passage. Rosenburg (1990) and Sommers (1994) provide very

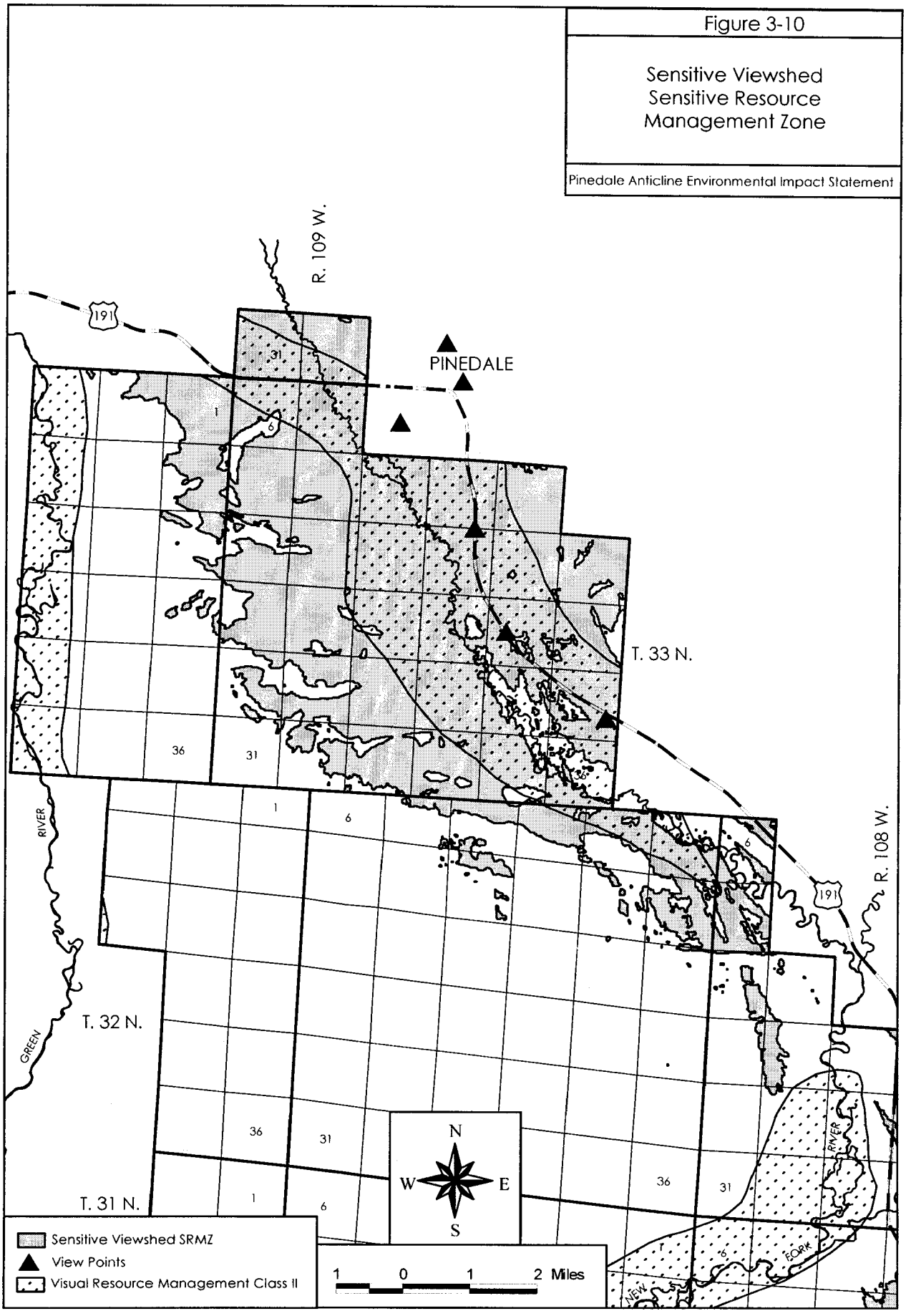


Figure 3-10
Sensitive Viewshed
Sensitive Resource
Management Zone
Pinedale Anticline Environmental Impact Statement
R. 109 W.
R. 108 W.
191
PINEDALE
T. 33 N.
T. 32 N.
T. 31 N.
GREEN
RIVER
NEW
FORK
RIVER
N
W
E
S
1 0 1 2 Miles
Sensitive Viewshed SRMZ
View Points
Visual Resource Management Class II

complete accounts of the settlement and history of the area.

3.10.2 Cultural Resources. As of the Fall of 1998, about 257 sites had been recorded by cultural resource inventory projects in the area. These investigations have provided valid inventory of approximately 3,036 acres. This results in an average site density of about 1 per every 12 acres. Additionally, about 4,520 acres were subject to Class II (sampling strategy) inventoried in the 1970s for internal planning purposes. These inventories do not meet current BLM standards. Recent interest in development of the area has caused an increase in the number of cultural resource investigations, sites recorded and evaluated. Noteworthy are the high numbers of sites in the 5,000 to 7,000 year old range and quite high site densities in the southern portion of the PAPA. The northern portion of the PAPA contains rock alignment sites and locals considered sacred or respected to modern Native Americans. High site densities are expected along the major water course throughout the PAPA.

Prehistoric site types known or suspected for the project area include prehistoric campsites, housepits, lithic scatters, kill/butchering sites, floral processing locales, sacred or respected sites, extensive lithic procurement locales, traditional cultural properties, limited activity sites and various rock alignment sites. Rock alignment sites include vision quest locales, stone circle sites such as tipi rings, medicine wheels and cairns. No drivelines are currently known, but in the vicinity of the Mesa, stone alignment/stone circle complexes are known. Such rock alignment sites frequently are found in association with large mammal hunting and driveline complexes. Human burials are reported for the project area, though their exact location is proprietary and not subject to public disclosure. The preliminary work conducted in this area suggests high site density, complex geomorphology, a greater variety of site types, and cultural resource management issues of greater complexity than in the adjacent Jonah II Field.

The earliest securely documented human occupations in North America are associated with projectile points of the Clovis and Folsom Traditions. Clovis and Folsom sites have been radiocarbon dated to between 12,000 and 10,500 years ago. These "paleoindian" sites represent early human adaptation to Late Pleistocene, postglacial environmental conditions. Early paleoindian occupations have been documented from the Jonah II Field. The 48SU389 complex records extensive prehistoric occupations associated with an assumed late Pleistocene perennial water source. The site complex has produced Folsom material, paleoindian artifacts in the Hell Gap, Agate Basin, Scottsbluff and Cody complexes, as well as numerous Archaic and Late Prehistoric period artifacts, a Bison bone bed, groundstone and other artifacts. Paleoindian occupations spanning a 12,000 to 8,000 years ago time period are suggested at this large site complex. Folsom occupations are reported from within the PAPA along the Green River, the northern Mesa region, and Trappers Point. Deep deposits containing buried cultural material of possible paleoindian age have been observed along the New Fork River.

By about 8,000 years ago, postglacial environmental conditions began to reflect a more modern setting. Pleistocene megafauna such as Mammoth, *Bison antiquus*, camel and the early horse became extinct. Human occupation sites reflect this shift, and archaeologists refer to the subsequent 6,000 years of prehistory as the Archaic Period.

Sites dating to the Archaic Period (roughly 8,000 to 2,000 years ago) are numerous in the project area. One site from this period was salvaged in the Jonah II Field. Hearths, lithics, tools and butchered and processed mammal bone were recovered from the excavations. Radiocarbon assay documented an occupation of 3,590±60 years before the present (BP). At the Trappers Point Archaeological Complex, located to the northwest of the project area, excavations have produced hearths, lithics, tools and butchered and processed mammal bone relating to 6,000 year old antelope procurement and processing activities.

Sites dating to the Late Prehistoric Period (1,800 to 200 years ago) are probably the most numerous. Recent inventory ancillary to a seismic survey recorded some seventy-odd new sites, many of which date to the Late Prehistoric period. Sites have produced both arrow points and ground stone, suggesting both hunting and plant food collecting as subsistence strategies.

An important site containing prehistoric Intermountain ware ceramics is located in the PAPA. At this site, sherds of brown-gray pottery containing sand (or grit) tempering may relate to similar ceramics recovered from the Wardell Site, located to the west. The identification of prehistoric ceramics on sites anywhere within the Green River Basin is unusual

and adds to the site's significance. Ceramic analysis can shed light on shared cultural affiliation with adjacent groups, such as the Fremont regions within Utah to the west and south, or the sedentary villagers to the south and east in Colorado.

Stone circle sites in the area represent preserved dwelling or residence sites that suggest a sedentary (or seasonal) existence. These sites, though currently undated, frequently are Late Prehistoric in age and good candidates for containing ceramics. Additionally, stone circle sites are considered respected and sensitive by some modern day American Indians. One stone circle site has been subject to a small salvage effort. Two hearths were excavated, but noteworthy was the recovery of portions of a steatite bowl. Steatite was aboriginally quarried in the adjacent Wind River mountains (Vlcek, 1993) and represents an unusual resource subject to transportation or trade with adjacent prehistoric populations. The recovery of steatite on sites removed from the mountains is rare, but not unknown in the Jonah II Field. Steatite use is more commonly documented on Late Prehistoric and protohistoric sites, though Archaic-aged use is documented. Steatite is also considered a sacred material by some modern day American Indians.

In the late nineteenth century, the area was used by predominantly the Shoshone; though Bannock, Ute and other Indian tribes frequented the Upper Green River. In prehistoric times, this picture is clouded as tribal distinctions are difficult, if not impossible, to determine. Both prehistoric sites and more modern American Indian use sites are respected (sensitive), or can be considered traditional cultural properties. Sites and properties within this class are protected by numerous laws, such as the Native American Graves Protection and Repatriation Act (NAGPRA), the American Indian Religious Freedom Act (AIRFA), and by various EOs. Human burials, rock alignment sites, petroglyphs, steatite procurement locales and modern day American Indian use, extraction or religious sites are considered respected, sensitive or sacred to modern American Indians. At least 4 such sites have already been identified and others are known for the area. Consultation with affected American Indians concerning the identification and management of traditional cultural properties and other sensitive sites has been initiated. BLM's Native American consultation has resulted in the identification of numerous sites and areas considered sensitive, respected or sacred to these tribal people.

Ongoing consultation with tribally recognized representatives of Native Americans has resulted in several recommendations. One is that no disturbance buffers around sensitive areas be increased from 0.25 mile to 1 mile in certain respected areas. Another is that BLM try to manage its land with respect to Native American interests more holistically, more regionally. For example, the Shoshone and Ute both consider larger strips of land on the Mesa as sensitive, not "a site here, a site there". They stress the interconnectedness of Mother Earth, and recognize that the animal, plant and human communities are interrelated and interdependent.

A number of Class III inventories have been conducted for the sales pipeline corridor (Sines, 1998a, 1998b, 1998c and Murray, 1998). The Class III inventories for the corridor resulted in the testing or documentation of 58 previously known sites, the evaluation of 19 previously unknown sites, and the identification of 9 isolated finds.

3.10.3 Historical Resources. The *Wyoming Comprehensive Historic Preservation Plan* (Massey 1989) defines historic periods and historic themes in order to record and evaluate historic sites. It is likely that the following periods and themes would be represented in the project area in Sublette County, Wyoming:

- Pre-Territorial (1842-1868);
- Territorial (1868-1890);
- Expansion (1890-1920);
- Depression (1920-1939); and
- Modern (1939-present).

Historic themes include agriculture (farming/ranching), architecture, commerce, education, social, and transportation. Westward migration began in large numbers in the 1840's, and several variations and cutoffs of the Oregon Trail evolved. One of the last emigrant trails to be laid out was the Lander Cutoff, which crosses the southern portion of the project area. Frederick West Lander, chief engineer, surveyed the trail in 1857 and completed the road in late 1858. The Lander Cutoff continued to receive wagon traffic even after the building of the transcontinental railroad in the late 1860's.

In 1978 Congress authorized the Oregon and Mormon Pioneer National Historic Trails to promote their preservation, interpretation, public use, and

appreciation. The Lander Trail was included in the congressional authorization. In compliance with the National Trails System Act, the NPS, Long Distance Trails Office (NPS/LDTO) has published a draft comprehensive management and use plan for these trails (NPS, 1998). The goal of that plan is the same as the purpose of the National Trails System Act, which is to *"provide for the outdoor recreation needs of an expanding population* and *to promote the preservation of, public access to, travel within, and enjoyment and appreciation of the open-air, outdoor areas and historic resources of the nation*".

One of the purposes of the NPS/LDTO draft management plan was to identify areas considered to be "high-potential segments". These route segments are defined as "*those segments of a trail which would afford a high quality recreation experience in a portion of the route having greater than average scenic values or affording an opportunity to vicariously share the experience of the original user of a historic route".* Ease of public access is also a factor that is considered in the process of determining "high-potential segments". Two segments of the Lander Trail adjacent to (but not within) the project area are proposed by NPS/LDTO as high-potential segments. The first is between Anderson Ridge to Buckskin Crossing to the east of U.S. Highway 191 and the project area. The other is from Piney Creek to Smith's Fork located west of U.S. Highway 189. Both of these segments parallel improved Sublette County or USFS roads for several miles. However, the Lander Trail through the project area was not considered a high-potential segment (NPS, 1998).

The viewshed (up to a distance of 3 miles on each side of the trail) of the Lander Trail is defined as a SRMZ. It has been determined that intrusions that are visible within approximately 3 miles either side of the centerline of the trail could adversely affect the setting of the trail. This SRMZ is relatively large, occupying approximately 22,813 acres or 12 percent of the PAPA. The SRMZ and an analysis of areas visible within the 3-mile wide corridor are shown on Figure 3-11.

Because Sublette County was far from the nearest railhead, several north-south wagon roads were established to link the project area with towns along the Union Pacific mainline, such as Rock Springs. By 1881, the Oregon Shortline had built northwest to Opal, which then became the closest rail point. Roads were also established to link small settlements with one another. Wagon roads between Rock Springs and New Fork or between New Fork and Big Piney are examples of such local/regional transportation routes (see Figure 3-12). Remnants of these early roads, including emigrant camping sites along the Lander Cutoff, may be encountered in the project area.

The sales pipeline corridor would cross 3 historic trail variants - the Sublette, Kinney (East Bank Kinney), and Slate Creek Cutoff - of the Oregon Trail. Only 1 of the sites encountered, the Mayfly Site located near the Green River crossing, is considered eligible for nomination to the National Register of Historic Places (NRHP). The other sites are considered non-contributing or non-significant cultural resources. The points at which the sales pipeline corridor would cross the historic trails have been previously evaluated as non-contributing portions of the overall eligible trail system.

Settlement in the project area spread from south to north along the major drainages, the Green River and New Fork River. Pioneer cattlemen established ranches close to major water sources and practiced open range grazing, wintering their herds on the Little Colorado and Red Deserts and summering them on higher pastures. Many of the Green River cattle ranchers were forced by the winter blizzards of 1888-1889 to begin to feed their cattle during the winter, rather than turning out their stock on the open range in the winter. Haying became an essential part of a typical Sublette County livestock operation, and continues to this day. Early ranchers had to clear sagebrush and establish water rights in order to irrigate hay meadows. The agriculture theme includes several site types likely to be found in the project area: operating and/or abandoned ranch complexes, homesteads, isolated structures (windmills, corrals, cattle shelters, or sheepshearing sheds), isolated refuse dumps, ranch or homestead-related refuse dumps, stock surveillance camps, and irrigation ditches. Stock surveillance camps (cattle and sheep) may be found in the northern Little Colorado Desert between the Green and New Fork rivers and southeast of the New Fork. Most of the irrigation ditches (operating and abandoned) within the project area divert water from the New Fork River and its tributaries; a smaller number divert water from

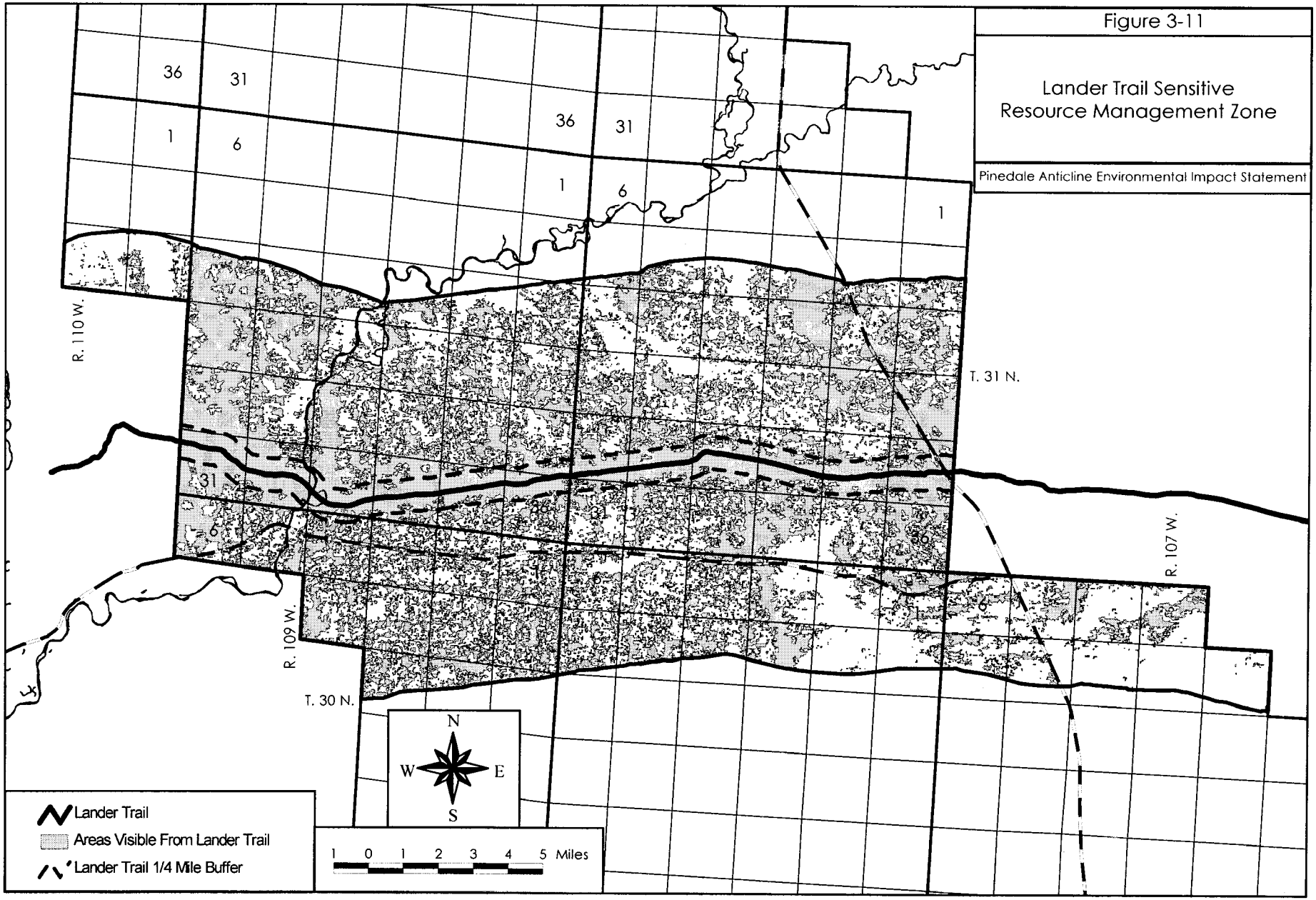
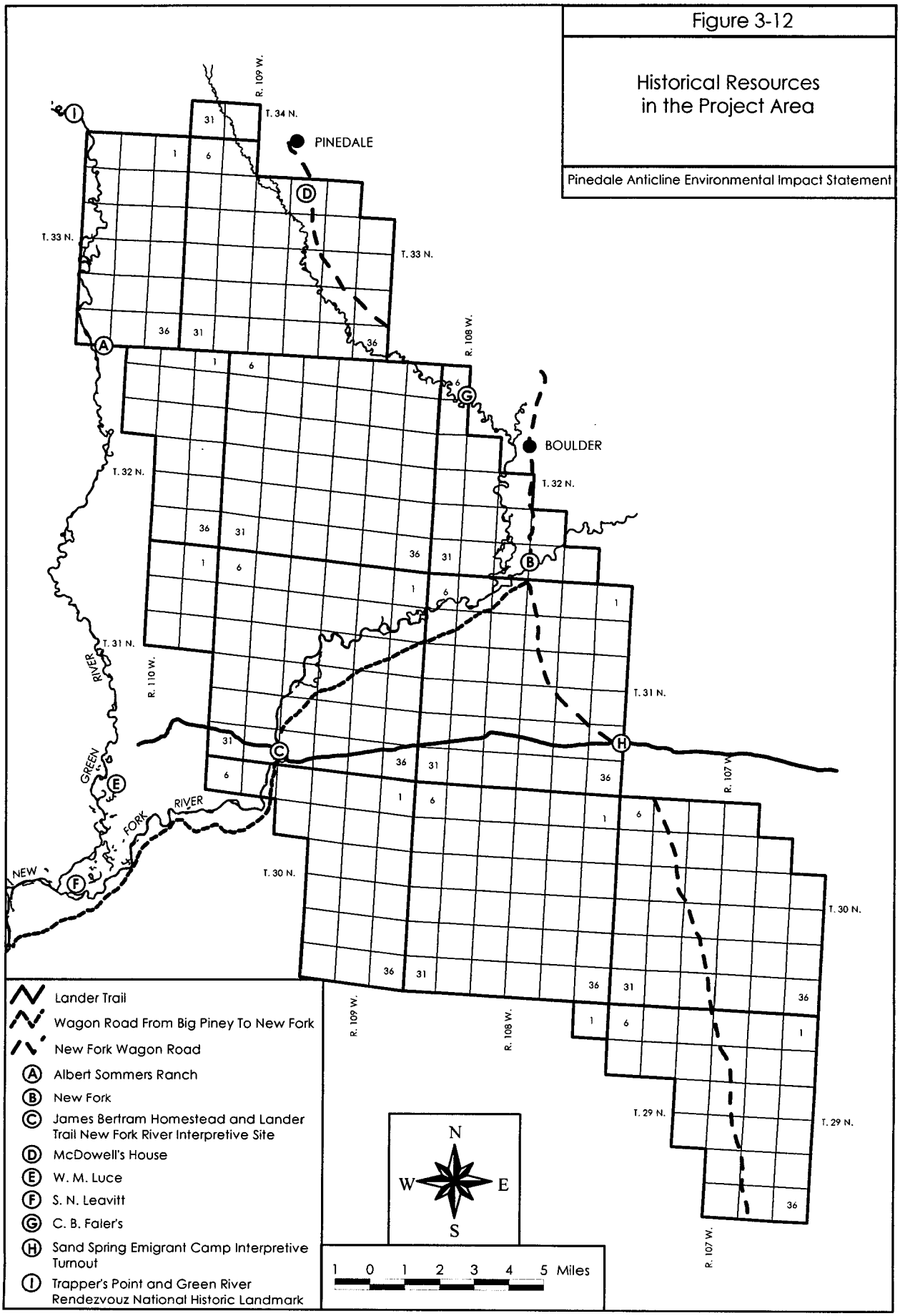


Figure 3-11
Lander Trail Sensitive Resource Management Zone
Pinedale Anticline Environmental Impact Statement
36
31
1
6
R. 110 W.
T. 31 N.
R. 109 W.
R. 107 W.
T. 30 N.
N
W
E
S
Lander Trail
Areas Visible From Lander Trail
Lander Trail 1/4 Mile Buffer
1 0 1 2 3 4 5 Miles

Figure 3-12

Historical Resources
in the Project Area

Pinedale Anticline Environmental Impact Statement



the Green River in the northwest portion of the project area.

Many of the pioneer ranches are located along the Green River and the lower New Fork River just west and southwest of the project area. The Albert Sommers Ranch (1903) on the Green River is located just outside the project area boundary. Remnants of the James Bertram Homestead (1906) are located on the lower New Fork River at the Lander Cutoff within the southwest portion of the project area. Some of these sites are plotted on Figure 3-12.

An important pioneer settlement located within the project area is New Fork Townsite, listed on the National Register of Historic Places, near the northeast boundary (see Figure 3-12). In 1888, John Vible and Louis Broderson, Danish emigrants, settled near the confluence of the New Fork and East Fork rivers about 5 miles north of the Lander Cutoff to establish a cattle ranch and mercantile business. They supplied their business by means of wagon trips to Rock Springs. Shoshone and Bannock Indians regularly traded there as they traveled to and from their respective reservations. A post office was established at New Fork in 1891; a polling place and school district soon followed. The community soon had the Vible stores, residences, a school, saloon, hotel, barber shop, livery and blacksmith shop, and in 1909, the large dance hall (Valhalla) was constructed. New Fork was gradually eclipsed by other communities, such as Pinedale, which became the county seat when Sublette County was established in 1921. Transportation patterns changed, the Lander Cutoff fell into disuse, and in 1915 a diphtheria epidemic devastated the small settlement. The Vible store and Valhalla still stand at New Fork (Broderson, 1976; Rosenberg, 1986; Vlcek, 1999).

The ranches and ranch land associated with the Green and New Fork rivers in the PAPA can qualify as a Rural Historic or Rural Cultural Landscape. The landscape encompasses the base ranches and select buildings, irrigated valley bottoms, adjacent dry pasturage and contributing historic features such as historic bridges and beaver slide hay stackers. The landscapes center around broad, linear riparian areas of the Green and New Fork rivers and may qualify for National Register of Historic Places inclusion as a Rural Historic Landscape.

The landscape has naturally defined geographic boundaries - the sandstone cliffs, ridges and buttes of the Mesa, which provides a pristine backdrop to the valley perimeter. Within the rural historic landscape, cattle ranching is practiced today in much the same way as in historic times, reflecting long-entrenched traditional life ways. The seasonal round begins with calving, old-style hot iron branding, and implementation of "The Drift", a biannual migration of up to 8,000 head of cattle "drifted" or driven up to 100 miles from the dry desert to the south up to summer pasture near Union Pass, at an elevation of 10,000 feet. The Drift survives as Wyoming's largest cattle drive and preserves a stock management system over a century old.

The rural historic landscape of the project area's river ranches remains little changed from historic times and contains several character-defining features such as the Sommers Ranch and Bridge, the Swain/Wardell Ranch and the Abner Luman Ranch within the Green River valley. The New Fork Townsite (listed on the National Register) is an example of a character-defining place combining nineteenth century ranching and commerce within the New Fork River valley. The Mocroft Ranch incorporates natural features such as Ruby Butte and the adjacent Mesa breaks in its character-defining boundary. The New Fork Cattle Bridge, an essential element of The Drift, is a structural example of a character-defining feature. The Green and New Fork River Rural Historic Landscape contains an abundance of historic places retaining a high degree of physical locational integrity, integrity of setting, feel and association, and historical significance.

For an expanded discussion of the archaeological, historic and rural cultural resources within the PAPA, see the Cultural Resources Technical Report.

3.11 Air Quality and Noise

3.11.1 RMP Management Objective. The RMP objective for air quality states *air quality will be maintained within or above required standards through cooperative management of emissions with industry, the State of Wyoming, and other federal agencies. Objectives will include the protection of public health and safety and the well-being of sensitive natural resources. The Bureau will strive to minimize, within the scope of its authority, any emissions which may add to acid rain,*

cause violations of air quality standards, or degrade visibility.

The Pinedale RMP contains a number of management actions that directly relate to air quality. In the RMP, BLM committed to cooperate and coordinate with USFS, EPA, and the State of Wyoming in monitoring for atmospheric deposition and its impacts on the Class I airsheds of the Bridger and Fitzpatrick wilderness areas. In the RMP, BLM noted that special requirements (within the scope of its authority) may be imposed on a case-by-case basis to alleviate air quality impacts. Examples pertinent to this project included in the RMP include limiting emissions, spacing of source densities, and requiring the collection of meteorological data. The authority to place a "cap" on emissions (i.e., regulate emissions through the promulgation of rule), and the determination of the need for this type of action, lies with the State of Wyoming. If the state determines that it is necessary to regulate emissions, it will do so through its State Implementation Plan (SIP) for air quality by promulgating appropriate rules. The EPA has oversight responsibility during this process and will approve the State of Wyoming SIP for air quality.

These measures were incorporated into the Standard Practices Applied to Surface-Disturbing Activities included in Appendix A-3 of the RMP. The standard practices included in the RMP specifically state that "*plant siting will be scrutinized to provide for public safety and to ensure that only areas with the least potential for transport of pollutants to the wilderness are considered.*"

3.11.2 Air Quality Affected Environment. The project area and general vicinity is in attainment for all the National Ambient Air Quality Standards (NAAQS) and Wyoming Ambient Air Quality Standards (WAAQS). Table 3-20 shows the measured background pollutant concentrations in the region as compared to the NAAQS and WAAQS. Particulate data (PM_{10}) were collected at the Seedskadee National Wildlife Refuge, approximately 37 miles south of the PAPA (WDEQ, 1995). It is assumed that total suspended particulate matter (TSP) concentrations would be the same as the measured PM_{10} values. It is also assumed that the maximum 24-hour particulate values result from wind-blown dust.

The nitrogen dioxide measured background was taken from representative data collected at the Carbon County Underground Coal Gasification (CCUCG) site in 1994 and 1995. Although the CCUCG site is approximately 126 miles southeast of the PAPA, it is within the same air basin. The sulfur dioxide data were gathered at the LaBarge Study Area which is 58 miles southwest of the PAPA. The background TSP data were gathered from a state monitor at Pinedale from January, 1990 to December, 1991. Measured background data for carbon monoxide were taken from representative data collected by WDEQ/AQD and commercial operators and summarized in the Riley Ridge EIS (BLM, 1983). Ozone data were taken from Pinedale, Wyoming.

The PAPA is classified as a Prevention of Significant Deterioration (PSD) Class II area and there are several Class I and II areas in the vicinity which are areas of concern, including Bridger and Fitzpatrick wilderness areas (see Figure 3-13). There are other Class II wilderness areas, such as Gros Ventre and Scab Creek which are not shown on Figure 3-13 because they have not been identified as areas of concern where sensitive receptors were placed during air quality impact modeling. Air Quality Related Values (AQRVs), which include the potential air pollutant effects on visibility and the acidification of surface water bodies, is a concern for the PSD Class I and Class II areas shown on Figure 3-13.

Visibility is often referred to in terms of atmospheric light extinction or visual range (i.e., the furthest distance a person can see a landscape feature). It also involves how well scenic landscapes can be seen and appreciated. When visibility is impaired by air pollution, the human eye perceives a loss of color, contrast and detail.

Visibility conditions vary regionally across the country. Natural visual range in the eastern U.S. is approximately 90 miles whereas current conditions range from 14 to 24 miles. In the western U.S., natural range is approximately 140 miles, while current conditions range from 33 to 164 miles. Since 1987, EPA has supported the Interagency Monitoring of Protected Visual Environments (IMPROVE) network in cooperation with the NPS, USFS, BLM, U.S. Fish and Wildlife Service (USFWS), and state organizations.

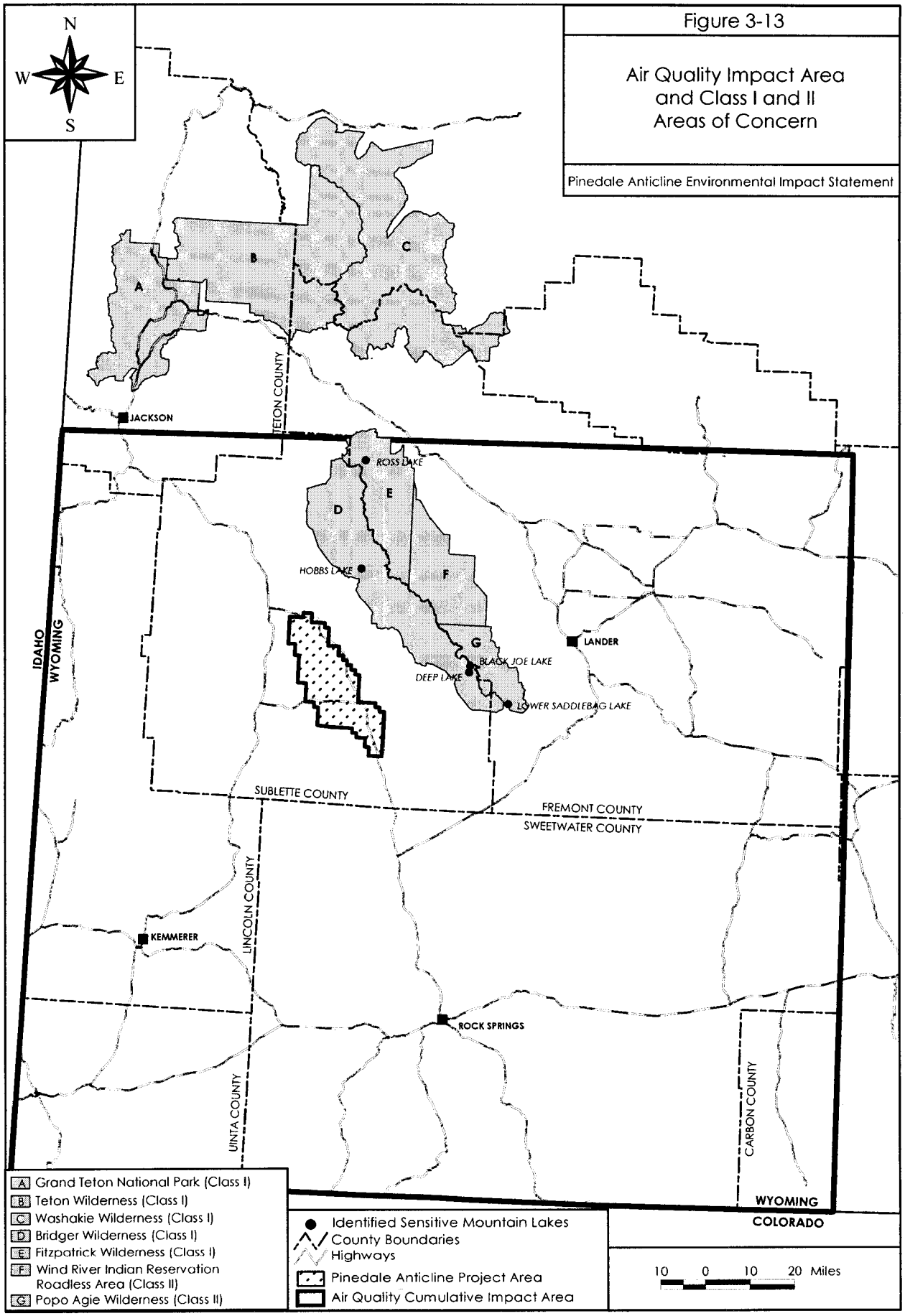


Figure 3-13
Air Quality Impact Area and Class I and II Areas of Concern
Pinedale Anticline Environmental Impact Statement
N
W
E
S
A
B
C
D
E
F
G
JACKSON
TETON COUNTY
ROSS LAKE
HOBBS LAKE
IDAHO
WYOMING
LANDER
BLACK JOE LAKE
DEEP LAKE
LOWER SADDLEBAG LAKE
SUBLETTE COUNTY
FREMONT COUNTY
SWEETWATER COUNTY
LINCOLN COUNTY
KEMMERER
ROCK SPRINGS
UINTA COUNTY
CARBON COUNTY
WYOMING
COLORADO
A Grand Teton National Park (Class I)
B Teton Wilderness (Class I)
C Washakie Wilderness (Class I)
D Bridger Wilderness (Class I)
E Fitzpatrick Wilderness (Class I)
F Wind River Indian Reservation Roadless Area (Class II)
G Popo Agie Wilderness (Class II)
Identified Sensitive Mountain Lakes
County Boundaries
Highways
Pinedale Anticline Project Area
Air Quality Cumulative Impact Area
10 0 10 20 Miles

Table 3-20
Measured Background Pollutant Concentration in Southwest Wyoming Compared to the National and Wyoming Ambient Air Quality Standards

Pollutant	Averaging Period	WAAQS (ug/m3)	NAAQS (ug/m3)	Monitored Background Concentration (ug/m3)
NO_2	Annual	100	100	9
SO_2	3-hour	1,300	1,300	132
	24-hour	260	365	43
	Annual	60	80	9
PM_{10}	24-hour	150	150	18
	Annual	50	50	8
$PM_{2.5}$	24-hour	N/A	65	10
	Annual	N/A	15	5
CO	1-hour	40,000	40,000	3,500
	8-hour	10,000	10,000	1,500
Ozone	8-hour	160	160	130

The objectives of IMPROVE (Cooperative Institute for Research in the Atmosphere, 1993) are:

- to establish current background visibility in Class I areas;
- to identify chemical species and emission sources responsible for existing man-made visibility impairment; and
- to document long-term trends.

This network began with 20 long-term monitoring sites in 1987 and now includes over 40 sites in parks and wilderness areas across the nation. Table 3-21 provides baseline visibility range data, collected by the IMPROVE network, for the Bridger Wilderness Area.

Table 3-21
Baseline Visual Range Data and Modeling Background Parameters for the Bridger Wilderness Area

	Mean of Cleanest 20 Percent	
Season	Visual Range (kilometers)	Visual Range (miles)
Spring	213	132
Summer	204	126
Autumn	230	143
Winter	264	164

Current visibility conditions (mean of the best 20 percent from 1987 to June 30, 1995) in the Bridger Wilderness Area based on IMPROVE aerosol monitoring data (Copeland, 1999)

Visibility in the region is very good at greater than 70 miles on 70 percent of days. Fine particles are considered to be the main source of visibility degradation. However, the potential for impairment to existing visibility in the Bridger and Fitzpatrick wilderness areas has been previously identified as an issue associated with oil and gas development in the upper Green River Basin (BLM, 1996). Other Class I areas such as Grand Teton National Park, Teton and Washakie Wilderness areas and Class II areas such as the Popo Agie Wilderness Area and the Wind River Indian Reservation Roadless Area have also been identified as areas of concern for visibility impairment.

Visibility impairment is expressed in terms of the deciview (dv), an index developed to be linear with respect to perceived visual changes over its entire range, analogous to the decibel scale for sound. A 1.0 dv change represents a change in scenic quality that would be noticed by the average person under many circumstances. A deciview of zero represents clean air, while deciviews greater than zero depict proportionately increased visibility impairment.

Atmospheric deposition (acid rain) is monitored as part of the National Acid Deposition Program/National Trends Network near Pinedale. Although the monitored deposition values are much below those considered to damage vegetation (BLM, 1996a), even low levels of acid deposition may exceed the acid neutralizing capacity (ANC) of certain high mountain lakes (BLM, 1996a). More than 10 years of measured baseline ANC data for 5 sensitive mountain lakes west of the project area is provided in Table 3-22 (Blett, 1998). The locations of these lakes are provided on Figure 3-13.

The USFS has identified specific AQRV "Level of Acceptable Change" (LAC) which they use to evaluate potential air quality impacts within their wilderness areas (USFS, 1993). The USFS uses a

Table 3-22 Acid Neutralizing Capacity in Five Sensitive Lakes	
Lake	**ANC (ueq/l)**
Black Joe Lake in Bridger Wilderness Area 1984 to 1998	55.2
Deep Lake in Bridger Wilderness Area 1984 to 1998	49
Hobbs Lake in Bridger Wilderness Area 1984 to 1998	63
Ross Lake in Fitzpatrick Wilderness Area 1985 to 1998	55.8
Lower Saddlebag Lake in Popo Agie Wilderness Area 1986 to 1998	58.3
Basis for ANC data is 10th percentile at lake outlet.	

magnitude of deciview change as an indicator for increases to regional haze and are currently using 0.5 deciview as a limit of acceptable change. The USFS has identified a LAC of no greater than 1 micro equivalent/liter (μeq/l) change in ANC from man-caused pollutants for lakes with existing levels less than 25 μeq/l. A limit of 10 percent change in ANC reduction was adopted for lakes with existing ANC over 25 μeq/l.

3.11.3 Noise Affected Environment. The EPA has published existing noise level data for typical types of areas (EPA, 1971). This published data is commonly used to estimate existing noise levels in areas around construction activities. Baseline noise measurements taken in several locations across the PAPA indicate that background noise is similar to EPA's category of "Farm in Valley". The background noise levels are listed for this category below:

Daytime - 39 dBA
Evening - 39 dBA
Nighttime - 32 dBA

Local conditions such as traffic, topography and the frequent high winds characteristic of the region can alter background noise conditions. Noise-sensitive areas identified in the vicinity of the PAPA include: sage grouse leks, crucial big game habitat during crucial periods; residences within and adjacent to the project area; areas adjacent to the Lander Trail; ranches along both the New Fork and Green rivers; raptor nest sites when occupied; and recreation areas.

3.12 Geology and Mineral Resources

3.12.1 Geology. The PAPA is located on an anticlinal ridge within the Green River Basin Geologic Province. The anticline trends parallel to the Wind River Range in the north of the basin, where the basin converges between the Wind River and Wyoming ranges. The structural basin filled with thousands of feet of continental and marine deposits in Paleozoic and Mesozoic times, and with river and lake deposits during Tertiary time. The anticlinal fold formed as the basin was uplifted in the mid to late Tertiary. Principal Tertiary formations which outcrop in the PAPA are the Wasatch, Green River and Fort Union formations, however, most of the PAPA is underlain by the Wasatch Formation. Younger glacial outwash and till terraces have buried the older formations in the PAPA north of the New Fork River and Quaternary alluvial deposits are found along the river flood plains.

The Paleocene to Eocene (lower Tertiary) Wasatch Formation outcrops or underlies alluvium over most of the project area. In the south, outliers of basal Green River Formation overlie the Wasatch. Pleistocene alluvial deposits of the ancestral Green River cover much of the upland areas, and recent alluvium veneers the modern drainage valleys.

The Wasatch Formation consists of gray and brown shales and sandstone. Elsewhere, as in the LaBarge Platform area, Wasatch sandstones may form gas reservoirs for hydrocarbons originating deeper in the section; in the PAPA, they are the principal water supply aquifer. The Green River Formation is represented by marginal deposits of the Eocene Lake Gosiute, which accumulated thick marlstones, oil shale and trona to the south.

Alluvium covering the Mesa in the north of the project area was deposited in late Tertiary in a fan at the head of the basin and are erosional remnants of more continuous deposits of the Greater Green River Basin through which the Green River subsequently cut down (Bradley, 1964; Love and Christiansen, 1985; Roehler, 1992 and 1993; Love *et al.*, 1993). Eight terrace levels have been identified in this flood plain complex (Dillon, 1998), constructed mainly of well-sorted, rounded cobble gravels. Modern alluvium in intermittent drainages is fine sand and weathered shale, and in major valleys is river and reworked terrace gravels.

Deeply buried strata bearing hydrocarbons have yielded oil and gas throughout the Green River Basin. Natural gas is found in several reservoir formations in the geologic section, with significant reserves in structural traps such as the Pinedale Anticline. The Jonah II Field to the south of the PAPA, which lies on the southwest flank of the anticline, is currently Wyoming's largest sweet gas field.

Geologic hazards are not of notable concern in the project area. Steep slopes on the flanks of the Mesa would be susceptible to small slides if disturbed, particularly in loose alluvium, but no slides or earthflows have been mapped in the area (Case *et al.*, 1991).

Earthquake epicenters have been mapped in the immediate vicinity of the PAPA and are presumed due to movement on thrusts deep beneath the anticline. The highest recorded intensity is III - Modified Mercalli Intensity Scale of 1931 (Case *et al.* 1995). There are some saturated alluvial deposits along the New Fork River valley in the PAPA that may be prone to liquefaction assuming a severe earthquake shock. During liquefaction, materials composed primarily of water-saturated sandstones and silts lose their strength and behave as viscous fluids. Liquefaction prone alluvial deposits are relatively recent (last 10,000 years) and have a water table within 30 feet of the surface (Case, 1986).

Initially, the U.S. Air Force requested a 10-mile buffer of no drilling activity around their Boulder, Wyoming facility. After further review, the Air Force reduced the buffer to 6 miles and the PAPA is no longer affected by the buffer.

3.12.2 Mineral Resources.

Oil and Gas. A largely undefined, unconventional natural gas resource is located in the deep, tight gas sandstones in the project area. This natural gas resource is considered unconventional because only in the last few years have new drilling and completion technologies advanced sufficiently to allow for commercial recovery of the gas in this formation. Much of the optimism regarding development of natural gas in the PAPA is the result of recent successes by the operators in the Jonah II Field, which is currently the most productive sweet gas field in the State of Wyoming. In the Jonah II Field, the operators have discovered that traditional drilling and fracturing methods don't work in the tight gas sands. The impurities in the tight gas sandstones swell in contact with acid or water and restrict gas flow through the reservoir. Wells are now drilled and fractured in ways that minimize the effects of water contact with the tight gas sands. In addition, the operators have learned to do multiple completions on individual pay zones encountered by a single well bore and then produce all zones on a commingled basis. This dramatically increases the gas flow from the well.

In the Jonah II Field, the operators have demonstrated the ability to recover significant reserves from otherwise non-productive tight gas sandstones using these new techniques. For example, early wells drilled in 1975 and 1988 using conventional drilling and completion techniques yielded initial production rates of about 0.300 to 0.500 MMCFD of gas. However, using new drilling and completion techniques in 1998, some Jonah wells have flowed gas with initial production rates greater than 10.0 MMCFD. The operators hope for the same successes in the PAPA.

The first well in the anticline area was completed by the California Company in 1939 to a depth of 10,000 feet. The well encountered non-commercial gas based on the gas prices at the time. The next well was not drilled until 10 years later in 1949 on the north end of the anticline. For about 50 years, various companies have been trying to drill commercial wells on the Pinedale Anticline. Natural gas resources have been confirmed to occur over much of the anticline in the tight, over pressured gas sandstones of the Lance and Mesaverde formations.

The problem in the past, as it is today, is to recover large enough volumes of gas to be profitable. Initial flow volumes from anticline wells decrease very rapidly - flows have been known to decrease 60 to 80 percent after only 1 year. In the past, initial production from most wells has been 1 to 2 MMCFD. By applying projected decline rates from the Jonah II Field (located adjacent to the south boundary of the PAPA) to anticline wells (which may be optimistic), the BLM's Reservoir Management Group developed the estimated ultimate recovery (EUR) in billion cubic feet (BCF) of gas per well based on initial flow rates shown on Table 3-23.

A gross dollar value is given based on a wellhead gas price of $2/thousand cubic feet (MCF) over the life of the well. Currently this price is about $1.40 to

Table 3-23
Initial Well Flow Rate and Estimated Ultimate Recovery

Initial Well Flow in (MMCFD)	EUR (in BCF)	Gross Value ($ millions)	Well Life (in years)
1	1.1	2.2	15
1.5	1.8	3.6	20
2	2.5	5.0	23
2.5	3.2	6.4	26
3.0	3.9	7.8	28

assumes decline rate of 60 percent for year one; 30 percent for year two; 15 percent for year three; and 8 percent for the productive life of the well to economic limit of 50 MCFD

$2.00 depending upon the season of year, although less than $1.40 has been paid recently for spot gas from the Jonah II Field.

Currently, anticline well drilling and completion costs (2 to 10 zones at about $200,000 per zone) run about $2 to $3 million, more or less, depending upon hole problems and number of zones completed. In comparison, Jonah wells average $1.5 to $2 million to drill and complete with well depths about 1,000 to 2,000 feet less and a thinner productive zone to complete. For an average well in the Jonah II Field (EUR of about 5 to 6 BCF), the operators may recover their initial well costs (payout) in less than 1 year.

Based on Table 3-23, marginally-profitable wells in the PAPA probably need at least an initial flow rate of 2 million cubic feet (MMCF) of gas from which about 2.5 BCF or $5 million gross value will be recovered over 23 years. Payout may take the majority of the 23 year period. It is important to note that these projected recoveries may be high and are based on Jonah II wells. Recent wells drilled on the anticline do not have enough production history to project EUR's directly. Wells that have initial gas flow rates of 3 MMCFD or more would probably be economical on the anticline under present gas prices.

Past Drilling History and Results. From the first well drilled in 1939 to January 1, 1997, there were 23 wells drilled in the PAPA. Wells have been drilled in every decade with mixed results. Of this total number, 10 wells have produced gas into a sales line from December, 1975 with total production of a little less than 6 BCF as of July, 1998 (about a $10 million present-day value using $1.70/MCF). The well with the most gas production on the anticline is the Jensen #1 drilled in 1980. This well has produced 1.63 BCF with first sales in December, 1982 when gas prices were at a peak. Eight of these 10 wells are still producing gas today at a combined rate of about 1 MMCFD (average of 125 thousand cubic feet per day (MCFD) for each well).

Assuming $2 million to drill and complete each of the 10 gas wells and $1 million to drill and plug the other 13, about $33 million plus lease costs has been invested to recover so far about $10 million present-day value. Most of these early wells are near the end of their economic productive life. In summary, gas production from wells drilled on the anticline before January, 1997 has not been a profitable venture with the exception of the 2 Jensen wells. The operator of these wells may have spent about $2.5 million on the 2 wells to recover about $5.5 million from gas sales (2.9 BCF).

Recent Drilling History and Results. Since January 1, 1997, 18 wells have been drilled and/or completed within the PAPA. Of this number, 11 wells were drilled/completed in 1997 while 7 wells were drilled in 1998 (1 on state, 2 on private, 4 on Federal minerals). The McMurry Pinedale Federal 13-2, which was drilled and plugged in 1997 due to hole problems, was redrilled from the same surface location in 1998 as the 13-2A well. This well had first gas sales in October,1998, with initial flow rates greater than 3 MMCFD. The 13-2A should be a profitable well with an EUR potentially greater than 3 BCF depending upon how fast initial flow rates decline.

The PAPA was producing approximately 13 MMCFD from 18 producing gas wells as of the first of November, 1998. Ten wells were producing 92 percent of the PAPA's total daily production. The remaining 1 MMCFD comes from the older 8 wells. Only 3 wells produced more than 2 MMCFD during November, 1998. At any time, operators may decide to recomplete or complete additional zones which may boost production considerably in existing producing gas wells. Recent recompletion of older Jonah wells has been very successful.

Productivity off Southwestern Flank of Anticline. Of the 41 total wells drilled to date in the PAPA, 7 wells have been drilled off the anticline to the southwest. Three wells of the 7 have produced gas, but at low rates totaling about 330 MCFD during the Fall, 1998. Alpine and Ultra are the recent

operators in this area. Ultra's Warbonnet 13-19 (drilled in 1997) is currently shut-in and has never produced. The well with the highest current flow rate off the southwestern flank is Ultra's Lovatt Draw 15-8. This well was drilled in 1997 and had its first gas sales in October, 1998.

The confirmation of natural gas occurring to the southwest off the anticline has been made by the drilling of the above wells. Very low initial flow rates have shown the area to be uneconomical under current gas prices. However, there does exist an outside chance of finding a small "sweet spot" where well profitability could occur. Only future, high-risk wildcat drilling could find such a spot, if it exists.

Economic Summary of Pinedale Anticline Production. The PAPA produced 0.57 BCF or an average of 1.56 MMCFD during 1997. Generally, there were 6 producing gas wells at any time during 1997. The year ended with 10 producing gas wells due to the record drilling of 11 new wells that year. The previous record production year was 1983 when Leonard Hay's Jensen wells came on line and gas prices were at their highest (about $3/MCF). The anticline produced 0.705 BCF in that year.

During the first 10 months of 1998, about 2.5 BCF of gas was produced within the PAPA. This equates to an average of 7 MMCFD - up significantly from 1997's 1.56 MMCFD. By the first of November, 1998, daily gas production was up to 13 MMCFD with 2 new large volume wells on line. In general, about 0.2 BCF is produced each month.

By December, 1997, the anticline had produced a total of about 5.9 BCF of gas and 47,500 barrels of condensate since its first production in 1975. Using $1.70 per MCF of gas and $10 per barrel of condensate, this equates to about a $11 million return of investment capital. Approximately $7 million worth of hydrocarbons were sold from wells within the PAPA in 1998 by producing an estimated 4.0 BCF of gas and about 32,000 barrels of condensate. Gas production from the Pinedale Anticline has now passed the 10 BCF mark.

Since 1939, 41 wells have been drilled within the PAPA. Using a conservative $2 million present-day drilling and completion well cost, this equates to about $82 million investment plus lease and operating costs (probably in excess of $100 million combined) that has yielded a gross income of approximately $18 million since first sales in 1975. Future capital returns depend upon the success of operators in finding and developing the anticline's hot spots that may yield high initial flow rates.

By contrast, in the Jonah II Field almost 100 wells have been drilled to date at a total investment cost of about $200 million. Estimated Jonah production for 1998 will be about 53 BCF of gas and 500,000 barrels of condensate. This equates to a production value of about $100 million for 1998. From 1992, the field will have produced over 100 BCF of gas and 1,000,000 barrels of condensate before the end of 1998 (or about a $185 million return). In general, for each dollar invested in developing the Jonah II Field, that dollar will be returned in about 1 year. This is a very profitable gas field that will most likely produce over 1 trillion cubic feet of gas in the next 15 years.

Other Mineral Resource. The only known mineral resource, other than oil and gas, which occurs in the PAPA is aggregate materials. These materials occur on alluvial and terrace sand and gravels along the Green and New Fork rivers. There are 33 known pits or quarries for these materials in or immediately adjacent to the PAPA (Harris, 1996).

3.13 Paleontological Resources

3.13.1 RMP Management Objective. Management actions for protecting paleontological sites include surface and subsurface stipulations and discretionary management authority. According to the Pinedale RMP, any actions to close or restrict areas for fossil protection will be evaluated on a case-by-case basis. The RMP describes the objective for paleontological resources as management of natural history and paleontological values to protect and preserve representative samples of these values that are in the planning area.

3.13.2 Affected Environment. Paleontologic resources include the remains or traces of any prehistoric organism. Fossils of scientific interest include those fossils of particular interest to professional paleontologists and educators. Vertebrate fossils are always considered to be of scientific interest; other kinds of fossils may be placed in this category by government land agency managers, in consultation with paleontologists or other experts (BLM, 1998e). Table 3-24 provides information on the various geologic formations

Table 3-24
Summary of Surface Geologic Deposits and Paleontologic Resources in the Project Area

Deposit	Geologic Age	Type of Deposit/ Environment of Deposition	Thickness	Fossil Resources	Fossil Potential
Alluvial sediments	Holocene	Unconsolidated silts, sandstones of valleys and plains. Terrestrial.	< 20 feet	none	low
Terrace deposits	Holocene	Gravels, silts and sandstones that predate current erosional cycle. Terrestrial-fluvial.	< 40 feet	none	unknown, probably low
Green River Formation Laney Shale LaClede Bed	middle Eocene	Chiefly oil shale, lesser algal limestone, sandstone, claystone and tuff. Lacustrine, accumulated during renewed expansion of Lake Gosiute.	<100 feet	vertebrates, invertebrates, trace fossils	high
Green River Formation Wilkins Peak (upper part)	early- middle Eocene	Chiefly brown or black oil shale interbedded with gray or green mudstone, evaporitic. Lacustrine, deposited during re-expansion of Lake Gosiute (upper).	<150 feet	vertebrates, invertebrates, plants	high
Green River Formation Tipton Shale Scheggs Bed	early Eocene	Chiefly oil shale, lesser algal limestone, dolomite, sandstone and mudstone. Lacustrine, deposited during first major expansion of Lake Gosiute.	<50 feet	vertebrates, invertebrates	high
Green River Formation Farson Sandstone	early Eocene	Chiefly parallel bedded, gray fine-grained sandstone, weathers to cliffs and ledges. Lacustrine-Deltaic.	300 to 400 feet	vertebrates, trace fossils	high
Wasatch Formation Cathedral Bluffs	early-middle Eocene	Varicolored, chiefly red sandstone and mudstone. Terrestrial, fluvial, flood plain, accumulated lateral to Lake Gosiute along basin margin.	<500 feet	vertebrates, plants	high
Wasatch Formation Alkali Creek Tongue	early Eocene	Interbedded brown, green, and gray sandstone, siltstone, mudstone and shale; locally conglomeratic. Chiefly terrestrial-fluvial to flood plain; some Lacustrine.	<100 feet	vertebrates, invertebrates, plants	high

present on and in the vicinity of the PAPA and their paleontologic potential (Winterfeld, 1998).

Along the modern river drainages and on modern terraces and buttes in the PAPA, rocks of the Wasatch and Green River formations are overlain by much younger unconsolidated sediments of Quaternary age. These sediments include alluvium, colluvium, stream terrace gravels and wind-blown sand that is late Pleistocene to Holocene (Recent) in age. These deposits are probably, for the most part, too young to contain fossils.

The Green River Formation is one of the largest documented accumulations of lacustrine sediments in the world and is particularly well known for its outstanding and abundant specimens of fossil fish and other vertebrates, insects and plants (Grande, 1984). Scientifically significant fossils have been known from the Green River Formation for more than 150 years. In the PAPA, the Green River Formation includes several tongues and members. These are, from youngest to oldest: (1) Laney Shale Member (including the LaClede Beds); (2) Wilkins Peak Member (middle and upper parts); (3) Tipton Shale Member (Scheggs Beds); and (4) Farson Sandstone Member. It is unclear which of these deposits actually outcrop in the PAPA and which are preserved near enough to the surface to be disturbed. All of these tongues and members have a high potential to yield scientifically significant fossils. In general, few outcrops of the Green River Formation are known to occur within the PAPA. Limited outcrops occur in the southeastern portion of the PAPA near the Jonah Field area.

The Wasatch Formation is composed mainly of fluvial deposits and is best known for its fossil mammals and mollusks (Grande, 1984). The Wasatch Formation in the PAPA consists of 2 recognized members which have a high potential to yield scientifically significant fossils; the Cathedral Bluff Member and Alkali Creek Member. The Cathedral Bluff Members form the top of the Wasatch Formation. It is underlain by and grades downward into the Alkali Creek Member of the formation. Outcrops of the Wasatch Formation are exposed over much of the PAPA. The Blue Rim south of State Highway 351 contains badland outcrops of the Wasatch and will need special paleontologic management (see Table 2-6 and Figure 3-15). Fossils may be encountered anywhere the Wasatch rocks are exposed on the surface.

A review of the institutional records conducted by Winterfeld (1998) resulted in the identification of 67 fossil localities of importance in the vicinity of the PAPA. An additional 15 localities of importance were identified in a published report on the geology and paleontology of the area. Thirty three recorded localities occur within the PAPA. All previously reported localities occur in the Wasatch Formation. The absence of recorded fossil localities in deposits of the Green River Formation in the project area is assumed to be more the result of the lack of study on the formation in the area and a mammalian bias of earlier workers than an accurate reflection of its fossil richness in the project area. Types of fossils recorded include turtles, mammals, rodents, and fish.

3.14 Water Resources

3.14.1 RMP Management Objective. The watershed management objective included in the RMP is to *maintain or enhance the quality of surface or ground water. Watersheds will be managed to maintain or improve channel stability and overall watershed conditions*

The RMP requires management actions to emphasize the reduction of soil erosion and sediment and salinity contribution to the Green River Basin water system. Corrective measures are to be applied where unsatisfactory watershed conditions are identified.

3.14.2 Groundwater. The Wasatch Formation and alluvial deposits are the most significant, shallow water bearing units in the project area. The Wasatch Formation supplies domestic and stock wells across the area, although it appears that some wells may also produce water from alluvium. Water quality in the Wasatch Formation ranges from Class I (suitable for domestic use) to Class III (suitable for stock use). Deeper Tertiary sandstones like the Fort Union contain saltier groundwater (greater than 2,000 mg/l dissolved solids) which is not generally tapped; some apparently converted gas production wells may have been used or tested for use in the past like the El Paso Natural Gas Wagon Wheel #1 wells (NW of Section 5, T. 30 N., R. 108 W.). Two special water wells were drilled at this location that reached depths of 2,500 and 5,200 feet, by far the deepest water wells ever drilled in the northern Green River Basin. The 2,500 foot well was later converted into a stock well.

As part of the Wagon Wheel Nuclear Stimulation Project by El Paso and the Atomic Energy Commission in the early 1970s, these wells were extensively studied for deep groundwater evaluation. The studies showed that freshwater (less than 1,000 ppm) in the arkosic Wasatch sandstones reached to a depth of 3,730 feet. A saline Wasatch tongue (about 20,000 ppm) lies below the 3,730 foot point.

The anticline forms a topographic ridge, which is a groundwater recharge area. Precipitation yields surface runoff, evapotranspiration (evaporation and transpiration) and infiltration to groundwater. Infiltration recharges terrace and drainage alluvium, and sandstones of the Wasatch Formation. One named spring (Mesa Spring) has been developed at the base of the terrace alluvium on the west side of the Mesa; elsewhere seepage from the alluvium on the Mesa is consumed by evapotranspiration. Drainage alluvial flow discharges to streams. Groundwater in the Upper Wasatch sandstones also flows in local circulation systems to the Green, New Fork and East Fork rivers.

A groundwater budget can be inferred from existing data. Average precipitation (rain and snow) is about 10 inches per year. Lowham *et al.* (1985) estimated that runoff is about 1 inch per year; at least 8 inches per year is likely consumed by evapotranspiration; the infiltrating balance is thus less than1 inch per year, amounting to less than 16,400 acre-feet annual groundwater recharge over the PAPA.

There are 297 registered wells supplying domestic and stock water within the PAPA. Declared yields range from a few gallons per minute (gpm) up to 100 gpm. Actual use should average less than 20 gallons per acre per day averaged over a year (based on stock carrying capacities), amounting to 2,200 acre-feet/year over the project area, extracted mainly from the Wasatch Formation.

Vertical flow from Wasatch sandstones through underlying shales is probably small compared to horizontal flow in alluvium and sandstones. A balance of as much as 14,000 acre-feet per year may therefore discharge to streams from drainage alluvium and sandstones. This is equivalent to an annual contribution to surface base flow of 20 cubic feet per second (cfs).

Water wells in the PAPA are generally less than 300 feet deep. Reported water levels range from 10 feet below the surface in drainages to 100 feet on interstream divides. Most water wells in the area produce from shallow sandstones of the Wasatch, although a few are completed in sandstones deeper than 600 feet. There is a consistent shale interval between the shallow and deeper sandstone zones under the Mesa, limiting hydraulic connection between them.

Water discharging to streams is likely to be of good quality, comparable to that in supply wells, with total dissolved solids (TDS) less than 1,000 ppm (Lowham *et al.*, 1985). Ions in alluvial groundwater are predominantly calcium bicarbonate. In the Wasatch Formation, they are sodium bicarbonate in shallow zones and sodium sulfate in deeper sandstones, evolving and accumulating higher salt concentrations along deep flow paths. Ions in alluvial groundwater in upland areas are expected to be predominantly calcium bicarbonate, and in the Wasatch Formation to be sodium bicarbonate due to ion exchange with clay minerals.

3.14.3 Surface Water. The PAPA lies within the Green River Basin which is part of the Colorado River drainage. Portions of 5 perennial streams and rivers flow through the PAPA including Duck Creek, East Fork River, Green River, New Fork River and Pine Creek. Duck Creek, East Fork River and Pine Creek are all tributary to the New Fork River and the New Fork River is tributary to the Green River.

The Green River originates just north of the project area, enters the PAPA in the northwest corner and then flows southward approximately 1 or 2 miles west of the project area. The Green River continues to flow south into Fontenelle Reservoir, which has a design capacity of 345,000 acre-feet. The reservoir has domestic, industrial, recreational, hydroelectric and irrigation uses. The Green River and its tributaries originate mostly in the mountainous areas where significant annual precipitation occurs and where geologic conditions induce groundwater discharge. Other streams originating in the interior semiarid and arid plains areas generally are ephemeral, flowing mainly in direct response to rainstorms and snowmelt with little or no groundwater contribution (Lowham *et al.*, 1985).

The majority of the annual runoff from streams draining the mountainous areas occurs during spring and early summer as a result of snowmelt. Streamflow generally peaks during June, although this varies annually from site to site depending on local climatic conditions and on physical features of the individual basins. Late summer, fall and winter flows are largely the result of groundwater inflows. Minimum stream flows occur during January through March. The total amount of runoff that occurs during any particular year is related to the amount of precipitation. Intermittent and ephemeral streams that drain the plains areas flow only periodically and often have extended periods of no flow. These streams may receive some groundwater inflows in addition to direct surface runoff, however, the groundwater inflows are insufficient to sustain flow throughout the year. There are springs in some areas of the plains and these springs commonly contribute small perennial inflows to streams. However, losses of water to evaporation, transpiration, seepage and freeze-up generally limit the extent of these flows only to short reaches downstream from the springs (Lowham *et al.*, 1985).

The majority of the PAPA is drained by intermittent and ephemeral streams. Figure 3-14 shows the locations of stream sub-basins in the project area and Table 3-25 lists the area (in square miles) of each sub-basin. Although there are several sub-basins, the PAPA overlies portions of 3 USGS Cataloging Units: 14040101, 14040102 and 14040104 which are for the Upper Green, New Fork, and Big Sandy watersheds, respectively. The New Fork River drainage collects water from the largest area in the eastern portion of the PAPA. This drainage is comprised of 33 sub-basins and includes drainage from Duck Creek, Sand Springs Draw, Lovatt Draw and several unnamed draws and ditches. Only intermittent flow from Tyler Draw, Henneck Draw and a few other unnamed draws in the northwest portion of the PAPA drain to the Green River directly on the west side of the PAPA. North Alkali Draw and Sand Draw drain to Alkali Creek which is tributary to the Green River in the southwest portion of the PAPA. In the southeast portion of the PAPA, Water Hole Draw, Mud Hole Draw, Bull Draw and other small draws drain to the Big Sandy River.

The USGS maintains a gauging station on the New Fork River west of the project area and approximately 3 miles upstream of the confluence with the Green River (see Figure 3-14). The gauging station (#09205000) measures streamflow from a 1,230 square mile drainage area and has operated continuously since 1954. The average annual mean streamflow over the period of record at this station is 741cfs. The highest daily mean occurred on June 7, 1986 when streamflow reached 9,110 cfs resulting in an annual mean of 1,288 cfs during that year. The lowest annual mean streamflow was 313 cfs in 1977. Average monthly streamflow over the period of record ranged from 200 cfs in January to 3,063 in June.

The Wyoming Environmental Quality Council, pursuant to W.S. 35-11-101 through 1304 [specifically Part 302 (a)(i)], has promulgated regulations for quality standards for Wyoming surface waters. The objectives of the Wyoming pollution control program are outlined in W.S. 35-11-102 and are specifically designed to maintain the best possible quality of waters commensurate with the designated use. The state has designated 4 classes of surface water. Streams in the PAPA that have been rated by the state are listed in Table 3-26. Any waters which are unlisted have the same classification as the first listed water to which it is a tributary.

WDEQ - Water Quality Division definitions for stream classifications which occur in the project area are listed below:

Class 1 - Those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution are to be controlled through implementation of appropriate best management practices. In designating Class 1 waters, the Environmental Quality Council considers water quality, aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archaeological, fish and wildlife, the presence of significant quantities of developable water and other values of present and future benefit to the people.

Class 2 - Those surface waters, other than those classified as Class 1, which are determined to (i) be presently supporting game fish; or (ii) have the hydrologic and natural water quality potential to support game fish; or (iii) include nursery areas or food sources for game fish.

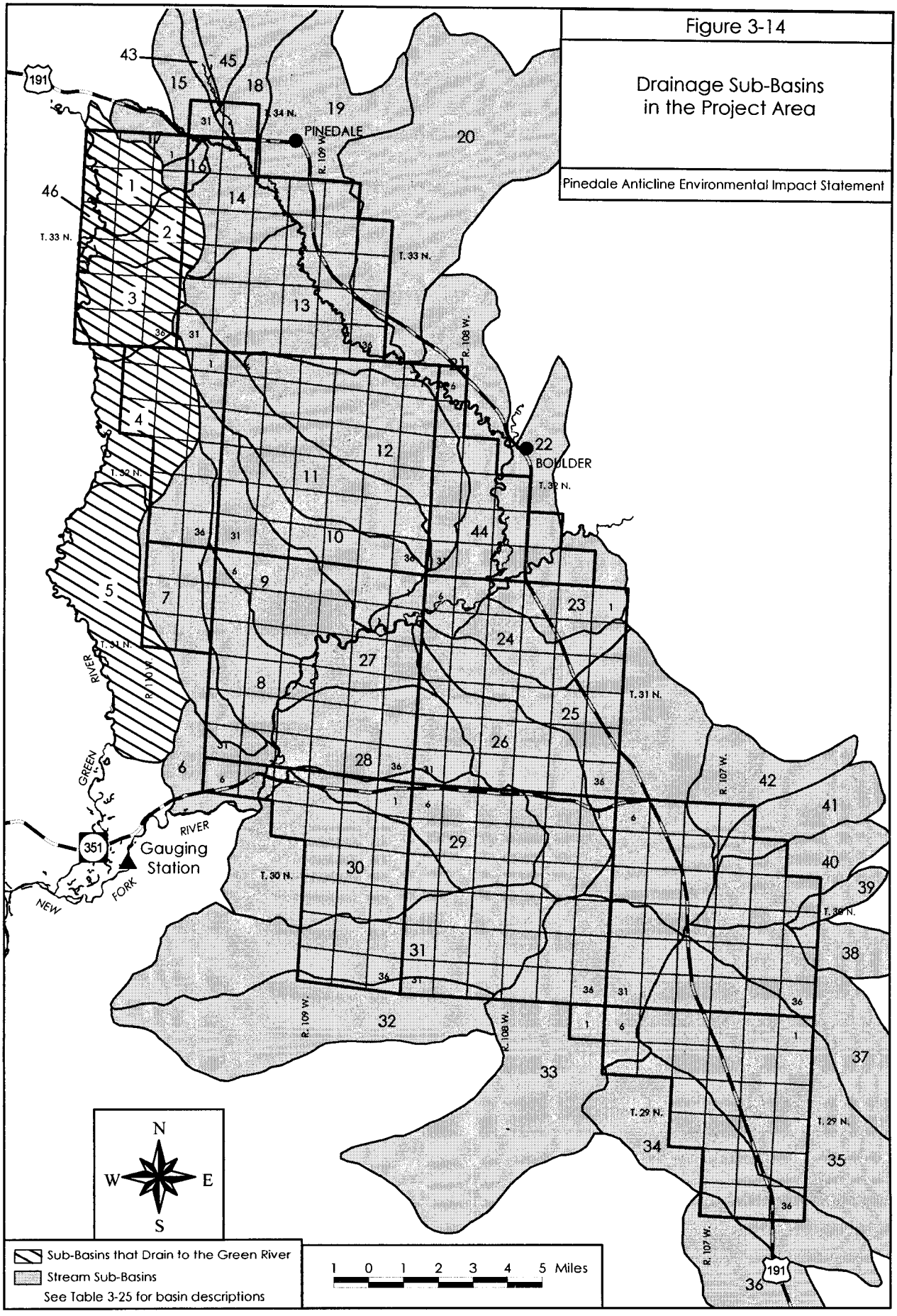


Figure 3-14
Drainage Sub-Basins in the Project Area
Pinedale Anticline Environmental Impact Statement
PINEDALE
BOULDER
Gauging Station
GREEN RIVER
NEW FORK RIVER
T. 34 N.
T. 33 N.
T. 32 N.
T. 31 N.
T. 30 N.
T. 29 N.
R. 109 W.
R. 108 W.
R. 107 W.
191
351
N
S
E
W
Sub-Basins that Drain to the Green River
Stream Sub-Basins
See Table 3-25 for basin descriptions
1 0 1 2 3 4 5 Miles

Table 3-25
Drainage Sub-Basins within the Project Area

Sub-Basin (River Drainage)	Basin Area (square miles)	Area within the PAPA (square miles)	Percent of Total Project Area
Unnamed Basin #1 (Green River)	5.04	4.64	1.51
Tyler Draw #2 (Green River)	4.3	4.3	1.39
Unnamed Basin #3 (Green River)	7.09	6.7	2.17
Mesa Spring #4 (Green River))	10.6	6.89	2.23
Unnamed Basin #5 (Green River)	16.21	0.37	0.12
Unnamed Basin #6 (New Fork)	6.16	2.74	0.89
Unnamed Basin #7 (New Fork)	12.48	10.57	3.43
Unnamed Basin #8 (New Fork)	7.41	7.41	2.4
Unnamed Basin #9 (New Fork)	12.68	12.68	4.11
Unnamed Basin #10 (New Fork)	8.46	8.46	2.74
Lovatt Draw #11 (New Fork)	13.57	13.57	4.4
Unnamed Basin #12 (New Fork)	16.56	16.56	5.37
Unnamed Basin #13 (New Fork)	12.62	12.53	4.06
Unnamed Basin #14 (New Fork)	5.95	5.95	1.93
Duck Creek #15 (New Fork)	3.88	1.04	0.34
Industrial Park #16 (New Fork)	1.14	1.14	0.37
Duck Creek #17 (New Fork)	2.43	1.09	0.35
Hay Gulch #18 (New Fork)	22.05	1.44	0.47
Pine Creek #19 (New Fork)	20.49	7.39	2.4
Pole Creek #20 (New Fork)	34.24	2.69	0.87
Unnamed Basin #21 (New Fork)	7.81	1.02	0.33
Unnamed Basin #22 (New Fork)	8.07	3.85	1.25
East Fork River #23	7.6	6.17	2
Unnamed Basin #24 (New Fork)	5.76	5.74	1.86
Sand Springs Draw #25 (New Fork)	28.99	19.92	6.46
Alkali Creek #26 (New Fork)	13.63	13.63	4.42
Unnamed Basin #27 (New Fork)	5.65	5.65	1.83
Unnamed Basin #28 (New Fork)	12.97	12.97	4.21
Unnamed Basin #29 (New Fork)	12.39	12.39	4.02
Ross Ridge North #30 (New Fork)	18.53	12.99	4.21
North Alkali Draw #31(Green River)	25.11	15.53	5.04
Granite Wash #32 (Green River)	19.43	1.74	0.56
Sand Draw #33 (Green River)	37.28	14.04	4.55
Bull Draw #34 (Big Sandy River)	18.82	8.27	2.68
Mud Hole Draw #35 (Big Sandy River)	31.13	20.42	6.62
Long Draw #36 (Big Sandy River)	13.51	0.46	0.15
Water Hole Draw #37 (Big Sandy River)	16.96	5.28	1.71
Unnamed #38 (East Fork River)	4.08	0.57	0.19
South Muddy Creek #39 (East Fork River)	2.07	0.52	0.17
Unnamed Basin #40 (East Fork River)	8.91	5.27	1.71

Table 3-25 Concluded			
Sub-Basin (River Drainage)	**Basin Area (square miles)**	**Area within the PAPA (square miles)**	**Percent of Total Project Area**
Oregon Trail Draw #41 (East Fork River)	6.4	1.3	0.42
Unnamed Basin #42 (East Fork River)	7.7	1.42	0.46
New Fork #43	6.03	0.07	0.02
New Fork #44	10.02	9.12	2.96
Willow Creek #45	17.28	0.01	0
Green River #46	Unknown	1.82	0.59

Table 3-26
Classifications of Streams within the Project Area

Stream	Classification
Green River (above New Fork River)	1
New Fork River	2
Duck Creek	2
East Fork River	2
Pine Creek	2
All intermittent and ephemeral drainages to Green River (above New Fork River)	1
All intermittent and ephemeral drainages to New Fork River and tributaries to New Fork River	2
All intermittent and ephemeral drainages to Alkali Creek	4

Class 4 - Those surface waters, other than those classified as Class 1, which are determined to not have the hydrologic or natural water quality potential to support fish including all intermittent and ephemeral streams. Class 4 waters receive protection for agricultural uses and wildlife watering.

Section 303(d) of the Clean Water Act requires states to identify waters which are not supporting their designated uses, and/or which need to have a Total Maximum Daily Load (TMDL) established to support their uses. There are no streams within the PAPA which are on the State of Wyoming's 1998 Section 303(d) List. However, there is a portion of the New Fork River which is included on Table E of the State of Wyoming's 303(d) program. This table lists those waters which the state has agreed to monitor over the next 5 years in order to determine whether they are supporting their designated uses or whether they are impaired and will need to have watershed plans or TMDLs established. Three waterbodies in the project area appeared on the 1996 303(d) list, but because insufficient data was available to determine use support, they do not appear on the 1998 list (Pratt, 1998). The monitoring of the New Fork River was conducted in October of 1998, however, analytical results of the monitoring will not be available until 1999. A determination as to whether or not the stream is meeting all beneficial uses will be made in late 1999/early 2000.

The major surface water resources along the sales pipeline corridor are the Green River and the Blacks Fork, which drains into the Green River. Neither river is considered impaired waters pursuant to Wyoming's Section 303(d) list. Both rivers are considered Class 2 waters.

3.15 Soil Resources

3.15.1 RMP Management Objective. The RMP objective for soils states that *soil conservation will be provided through managing for maintenance of soil productivity and stability.*

Like water quality, specific management actions for soil resources in the RMP are designed to reduce soil erosion and sedimentation and salinity contributions to area waters. Management actions include minimizing surface disturbance in areas with highly saline soils. The RMP requires the use of best management practices relative to the Clean Water Act of 1972 to control non-point sources of water pollution. The RMP requires soil management practices to be applied to proposed projects. These practices are related to the steepness of slopes, the length of slopes, and soil chemistry and composition. As an example of management practices to be applied throughout the resource area, the RMP describes seasonal closures due to saturated soil conditions.

3.15.2 Affected Environment. Existing soil information for the project area comes from state-wide reports (University of Wyoming, 1977 and Soil Conservation Service, 1975), BLM soil mapping (BLM, 1986), unpublished Natural Resource Conservation Service (NRCS) soil data (NRCS, undated), unpublished geomorphic/soil studies (Dillon, 1998) and detailed order three soil surveys (ERO Resource Corporation, 1988). Order three soil surveys have been completed for approximately 67,000 acres or 34 percent of the PAPA. To aid in preparation of this EIS, reconnaissance surveys were conducted in the PAPA to verify existing soil survey information and to identify potentially sensitive soils that have limitations and are susceptible to adverse impacts from the proposed development.

Soils in the project area have developed and are arranged according to parent material, topographic position, climate, vegetation and the length of time which these factors have interacted. The soils in the PAPA can be classified into 4 broad groups based primarily on differences in geologic origin (i.e., parent material and topographic or geomorphic position). These groups include: 1) terrace soils; 2) soils on pediment, alluvial fans and low terraces; 3) upland soils; and 4) alluvial soils on flood plains. There are no prime farmlands within the project area. The acreage of these soil groups within the PAPA is provided in Table 3-27.

Table 3-27
Soil Groups in the Project Area

Soil Group	Acres
Group 1 - Terrace soils	17,886
Group 2 - Pediments, alluvial fans and low terrace soils	56,504
Sensitive soils within this group (steep, shallow, high erosion potential)	8,584
Group 3 - Flood plain and wetland soils	10,936
Group 4 - Upland soils	101,126
Sensitive soils within this group (steep, shallow, high erosion potential)	2,309

Group 1 - Terrace Soils. Terrace soils occur in the north end of the project area on top of the Mesa. These soils developed from ancient river terrace materials and are nearly level, typically deep and have extremely gravely or cobbly subsoils in places (Dillon, 1998). This soil group has few limiting or sensitive characteristics. The reclamation potential of this soil group is high because of the good quality topsoil that is typically present in sufficient quantities. The engineering properties of this soil group for road and well pad development are high because of the high content of coarse fragments in the subsoils. The coarse fragments increase the soil's strength and reduce or eliminate the need to haul in suitable base materials for construction purposes. Approximately 17,886 acres of soils in this group occur in the project area.

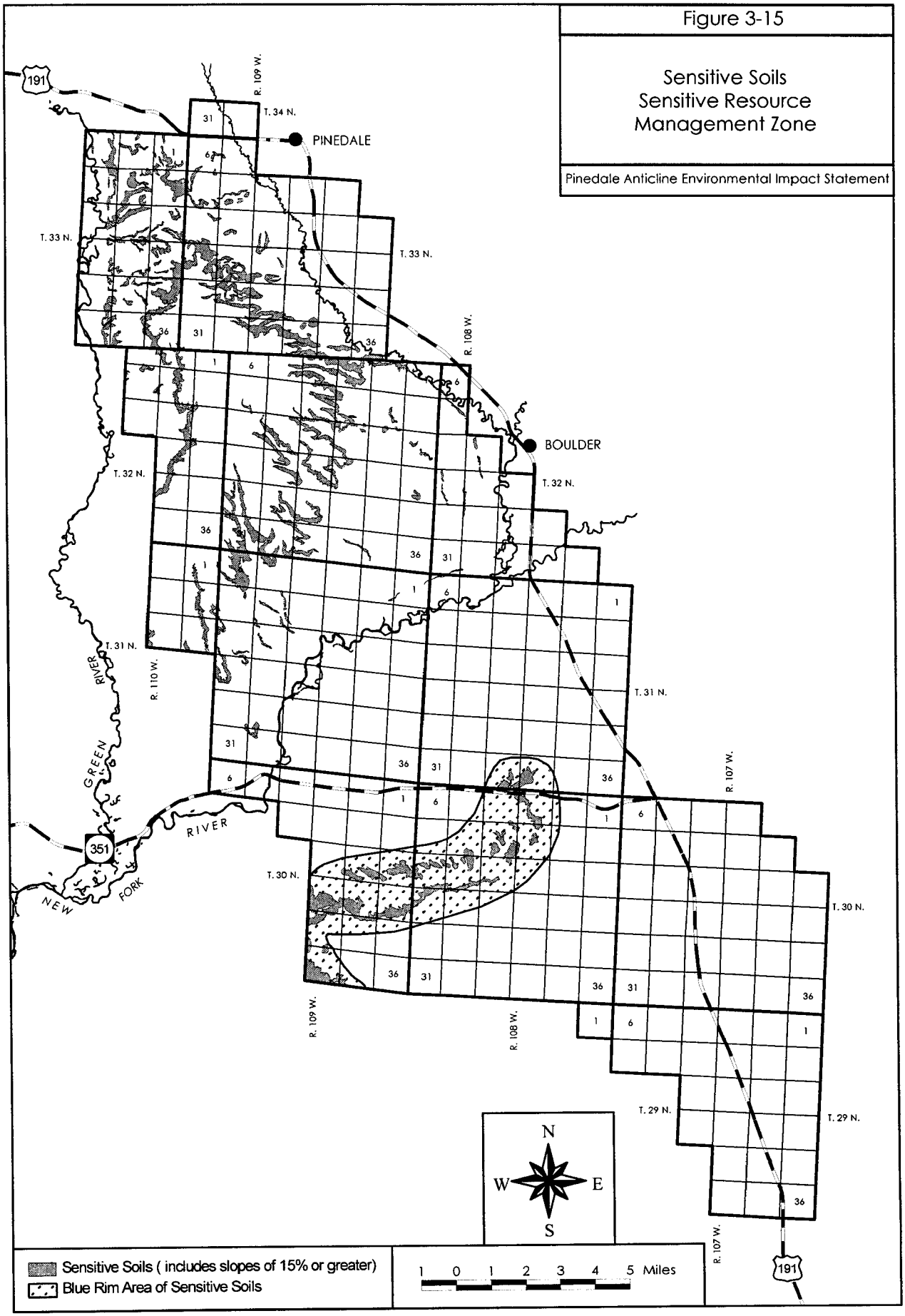
Group 2 - Pediment, Alluvial Fans and Low Terrace Soils. Soils on pediments, alluvial fans and low terraces occur in the north end of the PAPA on the flanks of the Mesa. These soils formed from deposition of erosional deposits or developed in residuum (i.e., weathered from rock in place) and their depths range from shallow to deep generally depending on their topographic position. These soils are gently to steeply sloping. Most of these soils are characterized as non-sensitive with moderate to high reclamation potentials. Several areas within the PAPA along the lower stream terraces are irrigated and cropped. Approximately 56,504 acres of this group occur in the project area. Sensitive soils within this group include steep soils on escarpments which are either exposed bedrock (Wasatch Formation) or are shallow to bedrock. These steep soils have a high runoff rate and erosion potential. The high runoff rate limits the effective moisture these soils receive and their shallow depth limits their water holding capacity. This causes these soils to be droughty which further reduces their reclamation potential. Approximately 8,584 acres of these sensitive soils occur in the project area. These steep sensitive soils are shown, along with other sensitive soils, on Figure 3-15.

Group 3 - Flood Plain and Wetland Soils. Flood plain and wetland soils within the PAPA were identified by reviewing Federal Emergency Management Agency (FEMA) flood plain maps and USFWS National Wetland Inventory (NWI) maps. These soils mainly occur along the Green and New Fork rivers and within the project area's major drainages (i.e., Alkali Creek, Lovatt, North Alkali, Sand, and Sand Springs draws). These soils are typically deep and vary in texture. Wetland soils that have hydric soil characteristics are common along the Green and New Fork rivers. Sensitive soil characteristics within this soil group include areas that are subject to flooding and soils with high water tables. This soil group has a high reclamation potential. The majority of the irrigated hay production in the PAPA occurs within this soil group. There are

Figure 3-15

Sensitive Soils
Sensitive Resource
Management Zone

Pinedale Anticline Environmental Impact Statement



approximately 10,936 acres of soil in this group within the PAPA.

Soils along the flood plains of the intermittent drainages in the southern end of the PAPA (e.g., Alkali Creek, North Alkali Draw and Sand Springs Draw) are typically saline and can be sodic. A soil is considered saline when its soluble salt content is high enough to interfere with the growth of most plants. Sodic soils are high in exchangeable sodium and may or may not be saline. The high sodium content in these soils tends to break down the soil's physical structure which limits water and air penetration. In addition, sodium can be toxic to certain plants. These soils are sensitive because of their potential to cause water quality impacts if disturbed. Eroded sediments from these soils could be transported to perennial waters. In addition, the salinity and sodicity of these soils reduces their reclamation potential.

Group 4 - Upland Soils. Upland soils occur in the PAPA south of the New Fork River and an order three soil survey is available for most (65 percent) of this area (ERO Resource Corporation, 1988). Soils in this group are generally alkaline and have developed from residuum and alluvium from uplands. These soils are nearly level to steeply sloping and range from shallow to deep. There are approximately 101,126 acres of soils in this group in the PAPA. Sensitive soils within this group include steep, shallow soils or areas of exposed bedrock (Wasatch Formation) along the Blue Rim. These soils have a high runoff rate and erosion potential. Paleontological materials may be located within this soil type. The high runoff rate limits the effective moisture these soils receive and their shallow depth limits their water holding capacity, causing them to be droughty which severely limits their reclamation potential. Badland soils are included in this sensitive soil group. These badland soils are unique landform features composed of raw exposed slopes of shale and soft sandstone, siltstone and marlstone. These sensitive soils are shown on Figure 3-15. Many are associated with the Blue Rim area, which is also shown on Figure 3-15. Approximately 2,309 acres of sensitive soils occur in this soil group.

A number of sensitive soils have been mapped in the project area (see Figure 3-15). Combined, these areas comprise the Sensitive Soils SRMZ. Development on these soils could result in excessive rates of erosion and sedimentation to area waters. Many of these soils will be difficult to reclaim.

3.16 Vegetation Resources

Several sources were used to develop the vegetation GIS coverage used for this EIS: field reconnaissance and mapping; BLM (1986) classification of Landsat imagery; Wyoming GAP Land Cover Map which is based on digital Landsat thematic mapper imagery (Merrill *et al.*, 1996); and 1994 black and white quad-centered aerial photographs enlarged to approximately 1:24,000 scale. Acreage of vegetation types within the project area is provided on Table 3-28.

Table 3-28
Acreage of Vegetation Types in the Project Area

Vegetation Type	Acreage
Sagebrush steppe	146,535
Mixed grass prairie	12,132
Greasewood flats	1,864
Desert shrub	11,622
Riparian forest and shrub	4,334
Other limited types	322
Barren ground	1,416.5
Irrigated cropland	17,616.5
Human settlement	1,503
Total	197,345

The PAPA is within sagebrush steppe, a dense to open grassland with shrubs scattered throughout in dense or open patches (Küchler, 1964), that predominates throughout southwestern Wyoming. This is, by far, the dominant vegetation type in the PAPA. There are other plant communities distinct from sagebrush steppe or that form a continuum with sagebrush steppe. Though not as extensive, these vegetation types include mixed grass prairie, riparian forest and riparian shrub dominated vegetation, greasewood flats, and desert shrub. Mountain shrub, limber pine, and aspen vegetation are also present, albeit in extremely small patches with limited distributions. There are also barren areas nearly devoid of vegetation on rock or clay outcrops in eroded badlands topography. In addition to these native vegetation types, approximately 19,119 acres of the PAPA has been converted (in decreasing order of abundance) to irrigated riparian and upland croplands, human settlements, and human-related surface disturbance such as paved and unpaved roads, pipeline corridors, gravel pits, water impoundments, and gas well pads (see Table 3-28).

Sagebrush Steppe. This type is predominant (representing approximately 74 percent) throughout the PAPA. Two principal sub-types are present: high density and low density sagebrush, each with either Wyoming big sagebrush or mountain big sagebrush as the dominant species. Low density sagebrush on the PAPA roughly corresponds to BLM's (1986) classification in which the shrub canopy cover is less than 35 percent and is equivalent to Wyoming GAP Land Cover delineations of Wyoming or mountain big sagebrush occupying 80 percent or less of an area. Conversely, the high density sagebrush sub-type mapped on the PAPA has shrub canopy cover of more than 35 percent and big sagebrush occupies at least 90 percent of an area.

Mixed Grass Prairie. This type occurs as patches dispersed in low density and high density big sagebrush types on slopes and ridges where soils are generally shallow. Mixed grass prairie occupies 6 percent of the project area. Although grasses (needle-and-thread, bottlebrush squirreltail, sandberg bluegrass, thickspike wheatgrass, western wheatgrass, Indian ricegrass) appear to be dominant, much ground is covered by cushion plants, such as wild buckwheat, sandwort, phlox, pussytoes, a variety of subshrubs (winterfat, fringed sage, horsebrush) and forbs.

Greasewood Flats. In the PAPA, black greasewood is limited to several intermittent stream drainages with highly alkaline soils. Consequently, there are no expanses of greasewood in the PAPA. Gardners saltbush is a common component of this limited type as well as foxtail barley, Indian ricegrass, bottlebrush squirreltail, alkali sacaton, birdsfoot sagewort, and gray horsebrush. Only 1 percent of the project area is occupied by this type.

Desert Shrub. Saltbush, winterfat, birdsfoot sagewort, gray horsebrush, and bud sagebrush are found in areas that are classified as salt desert shrub. Like greasewood, these shrubs occur in highly alkaline soils but are more widespread on shaley clay soils and alluvial washes. Six percent of the project area is occupied by this type.

Riparian Forest and Shrub. Most of the riparian communities along the major drainages through and adjacent to the PAPA (Green River, New Fork River, East Fork River) occur on private land and are now irrigated hayfields. There are areas of willow shrub that dominate the landscape but with understories that are moist meadow grasses (tufted hairgrass, creeping bentgrass, meadow foxtail, Kentucky bluegrass), sedges (beaked sedge, Nebraska sedge, woolly sedge), rushes (spikerush, swordleaf rush), and forbs (Pacific aster, red and strawberry clover, willowherb). Sandbar willow, Geyer willow, shrubby cinquefoil and silver sagebrush are principal woody shrubs. Patches of narrowleaf cottonwood riparian forest are present along the rivers with similar understories as those in the shrub-dominated communities.

Other Limited Types. Narrow strands of mountain shrub vegetation, including bitterbrush, buffaloberry, snowberry, and serviceberry, are found along south and west-facing ridges associated with the many eroded draws extending into the Mesa. Areas of mountain shrub also occur at the highest elevations in the PAPA (i.e., Stewart Point and Mount Airy). Limber pines occur on east-facing cliffs of the Mesa and a small aspen stand is present on the east side of the Mesa.

Barren Ground. Areas of very little or no vegetation are present in the PAPA on rock outcrops and steep slopes of draws on the Mesa perimeter and clay badlands extending north of Blue Rim in the southern part of the project area.

Irrigated Cropland. Irrigated croplands and hay meadows occur along privately-owned riparian corridors where native and introduced species, such as Kentucky bluegrass, have been developed for livestock. Also, upland areas have been developed to produce alfalfa hay and are irrigated either by ditches or pivot irrigators. In Sublette County, alfalfa hay crops typically produce about 4 tons/acre from 2 cuttings. Native and introduced grass hay crops in the county generally produce about 1 and 0.5 tons/acre from one cutting, respectively (Peterson, 1998).

Noxious Weeds. EO 13112 "Invasive Species" (species whose introduction does or is likely to cause economic or environmental harm or harm to human health), was signed by President Clinton February 3, 1999. Its purpose is to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause. Noxious weeds include invasive species. Both occur as isolated infestations in the PAPA, but limited funding has precluded active weed control in the area. However, there is concern that they will invade areas with soil disturbance and eventually become established. It is

probable that seed from the small infestations and from outside sources will spread to the new soil disturbance, resulting in major infestations. Noxious weeds are typically very aggressive and have the ability to dominate many sites with dramatic impacts to native plant communities. Wildlife habitat deteriorates, erosion increases, water quality diminishes, nutrient cycling and infiltration are altered and recreational values are degraded (BLM, 1996b). There are 22 noxious weeds of concern in Sublette County; 10 of these are of concern in the PAPA and are listed on Table 3-29.

Table 3-29
Noxious Weeds of Concern in the Project Area

Common Name	Scientific Name
Canadian thistle	*Cirsium arvense*
Musk thistle	*Carduus nutans*
Black henbane	*Hyoscyamus niger*
Dyer's woad	*Isatis tinctoria*
Hoary cress (whitetops)	*Cardaria draba and Cardaria pubescens*
Perennial pepperweed (giant whitetop)	*Lepidium latifolium*
Russian knapweed	*Centaurea repens*
Spotted knapweed	*Centaurea maculosa*
Leafy spurge	*Euphorbia esula*
Perennial sowthistle	*Sonchus arvensis*

3.17 Grazing Resources

3.17.1 RMP Management Objective. The RMP objective for grazing resources states that *vegetation will be managed to maintain or improve ecological range condition, and to maintain or increase forage for livestock grazing, while providing for the maintenance or improvement of wildlife habitats, watershed values, and riparian areas. Objectives of the livestock management program in riparian areas will include maintenance, restoration, and improvement of riparian values where livestock grazing has contributed to riparian management problems.* Specific management actions identified in the RMP include maintaining adequate stock trails.

3.17.2 Affected Environment. Grazing continues to be the major land use in the project area. Cattle raising on the Upper Green River has a rich history and there are several good sources of information that describe the importance of this industry in the development of the area. Although there are several references available that describe the ranching history of the area, one that contains a great deal of background about the project area is Green River Drift, History of the Upper Green River Cattle Association by Jonita Sommers (1994). Another good summary of the role of livestock in development of the Upper Green River area is by Rosenburg (1990).

There are 16 livestock grazing allotments that coincide with the PAPA (see Table 3-30) ranging in size from 57,649 acres (Mesa Common) to 655 acres (Burch). The allotments are shown on Figure 3-16. These allotments contain 34,940 animal unit months (AUM) of which approximately 16,556 occur within the project area. One allotment, the Boundary/Poston, is within BLM's Green River Resource Area. Cattle are the predominant livestock species grazing in the PAPA, mostly from May through June and early July although cattle in some allotments remain into September or November.

Five of the allotments have been classified as "I", those in need of improvements. Most improvement recommendations stem from limited water supplies, at least in a portion of an allotment. In these, limited water affects livestock distribution and range use. Numerous water impoundments, though, have been developed throughout the PAPA. In the past, several allotments were sprayed with herbicides to reduce sagebrush growth and promote herbaceous vegetation, primarily grasses. Two Allotment Management Plans - cooperative agreements between BLM and livestock permittees that define management objectives, desired actions and evaluations - have been prepared which involve 3 of the grazing allotments coinciding with the PAPA.

During an inventory of fences on BLM land in southern Wyoming, De Groot (1992) found that the Pinedale Resource Area had the highest density of fences (0.56 miles of fence per square mile of BLM land) of all BLM resource areas examined. All allotments coinciding with the PAPA have been fenced, some with 4-strands others with 3-strands of barbed wire. Generally, all net-wire, all 6- and 5-strand fences, and 4-strand fences with bottom wires less than 13 inches from the ground are considered as restrictions to pronghorn movements (De Groot, 1992).

Each year many of the cattle that graze Desert common area and the Mesa are trailed across the Mesa north heading toward grazing allotments on USFS lands on the upper Green River. Up to 8,000

Figure 3-16

Grazing Allotments
in the Project Area

Pinedale Anticline Environmental Impact Statement

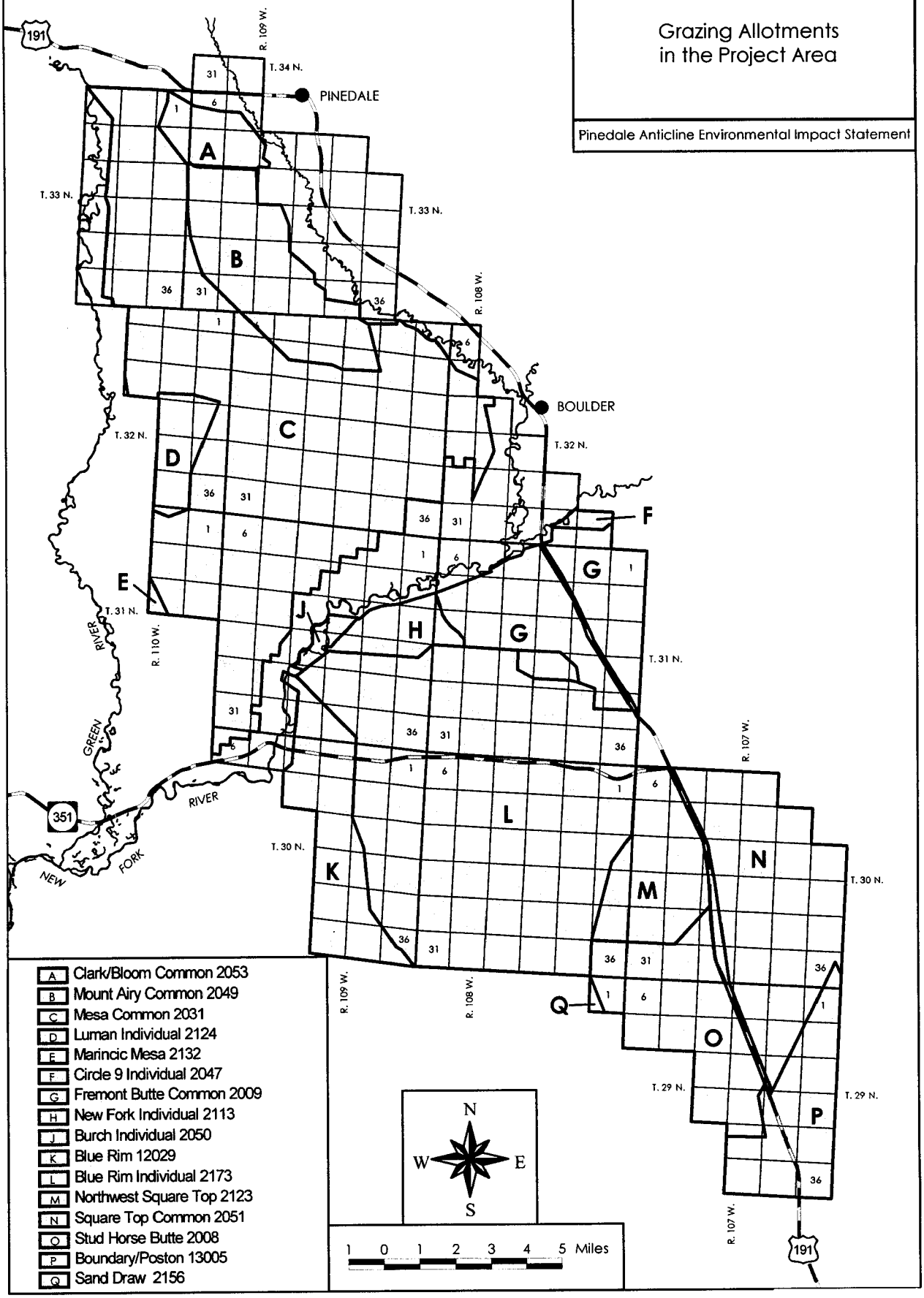


Table 3-30
Livestock Grazing Allotments Coinciding with the Project Area

Allotment Name (number)	Season of Use	Livestock and Numbers	Management Category (1)	Acres				AUMs				Acres/AUM
				BLM	State	Private	Total	BLM	State	Private	Total	
Blue Rim Individual (2173)	05/10 - 06/23	cattle 2,355	I	36,585	2,240	2,120	40,945	3,258	199	188	3,645	11.23
Circle 9 Individual (2047)	05/01 - 07/05	cattle 226	M	520	54	168	742	63	13	13	89	8.34
Clark-Bloom Common (2053)	05/16 - 07/29	cattle 249	I	2,417	0	22	2,439	262	0	2	264	9.24
Blue Rim Desert (2029)	05/01 - 06/21	cattle 1,600	M	40,378	947	598	41,923	2,538	68	51	2,657	15.91
Fremont Butte Common (2009)	05/01 - 07/05	cattle 1,172	M	21,015	800	569	22,384	2,410	92	66	2,568	8.72
Luman Individual (2124)	05/20 - 07/19	cattle 300	M	2,954	0	0	2,954	600	0	0	600	4.92
Marincic Mesa Individual (2132)	05/01 - 06/15	cattle 231	I	5,955	0	51	6,006	350	0	5	355	16.92
Mesa Common (2031)	05/01 - 11/15 05/01 - 10/31	cattle 4,541 horses 18	M	55,789	1,220	640	57,649	4,701	197	105	5,003	11.52
Mount Airy Common (2049)	05/16 - 06/25	cattle 692	I	9,732	0	7	9,739	757	0	1	758	12.85
New Fork Individual (2113)	05/10 - 06/20	cattle 260	M	1,850	0	560	2,410	302	0	59	361	6.68
Burch (2050)	not restricted	cattle	M	325	62	268	655	37	10	53	100	6.55
NW Square Top Individual (2123)	05/01 - 06/28	cattle 506	M	6,869	100	35	7,004	980	14	5	999	8.01
Square Top Common (2051)	05/01 - 09/25 05/10 - 07/01 05/01 - 11/30	cattle 2,020 sheep 3,300 horses 48	I	38,509	2,040	245	40,794	4,469	237	25	4,731	8.62
Stud Horse Common (2008)	05/01 - 06/30	cattle 1,087	M	13,808	1,280	0	15,088	2,173	213	0	2,386	6.32

Table 3-30
Concluded

Allotment Name (number)	Season of Use	Livestock and Numbers		Management Category (1)	Acres				AUMs				Acres/AUM
					BLM	State	Private	Total	BLM	State	Private	Total	
Boundary/Poston (13005)	05/01 - 07/15	sheep	4,036		77,246	5,597	1,923	84,766	7,152	518	178	7,886	10.80
	05/01 - 06/30	cattle	315										
	09/15 - 11/30	sheep	6,198										
	10/15 - 12/14	cattle	315										
	05/01 - 12/31	horses	14										
	06/01 - 07/31	cattle	43										
	05/01 - 05/02	sheep trailing	3,134										
	09/10 - 09/11	sheep trailing	3,134										
	05/19 - 06/28	sheep	1,000										
	10/14 - 10/31	sheep	1,540										
	11/28 - 12/01	sheep trailing	826										
Sand Draw (02156)	09/01 - 11/07	Sheep	600	M	30,687	1,280	0	31,967	2,415	123		2,538	12.71
	05/01 - 06/21	Cattle	1,200										

1 = Management category: M = present range condition is satisfactory; I = present range condition is unsatisfactory or in a declining trend.

cattle are trailed across the Mesa in small individual herds beginning in mid-June. By early July this trailing has usually been completed. During the month of October these livestock begin trailing back to their home ranches. Cattle are separated at Trappers Point each morning. Some of these cattle are driven in small groups across portions of the Mesa to private land. Some of these cattle are released on the north end of the Mesa and allowed to drift to the south end (approximately 17 miles). These cattle are then gathered from the south end of the Mesa and taken to their home ranches.

3.18 Wetland and Riparian Resources and Flood Plains

3.18.1 RMP Management Objective. The RMP requires that all actions comply with EOs 11988 Flood Plain Management and 11990 Protection of Wetlands. A specific management objective of he RMP is to *maintain, improve, or restore riparian values to provide enhanced forage, habitat, and stream quality*. The RMP states that riparian management is an integral part of all resources and related management programs.

3.18.2 Affected Environment. Riparian areas are plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent water bodies (rivers, streams, lakes, or drainage ways). Riparian areas have one or both of the following characteristics: 1) distinctly different vegetative species than adjacent areas, and 2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Riparian areas are usually transitional between wetland and upland (USFWS, 1997). In layman's terms, they are the green zones along the banks of rivers and streams and around springs, bogs, wet meadows, lakes and ponds.

Wetlands are subject to protection under Federal law and EO 11990, regardless of land ownership. The EPA and COE use the following definition of wetland for administering the Clean Water Act's Section 404 permit program for dredge and fill activities: *those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas*" (40 CFR Part 230.3 and 33 CFR Part 328.3).

Wetlands have 3 essential characteristics: 1) hydrophytic vegetation; 2) hydric soils; and 3) wetland hydrology. The USFWS has developed a list of wetland plant species (Reed, 1988) and the NRCS has developed a list of hydric soils and characteristics that are used in delineation.

The principal riparian resources of the PAPA are the Green River and New Fork River and the major intermittent drainages in the PAPA including Lovatt Draw, North Alkali Draw, Sand Draw and Sand Springs Draw. Riparian areas adjacent to perennial streams, such as the Green and New Fork rivers, usually contain willow and cottonwood communities, wet meadows, and irrigated fields that are all likely to exhibit wetland characteristics. Riparian areas adjacent to intermittent and ephemeral streams may also contain wetlands where seasonal flows and high water tables are present. Intermittent and ephemeral streams that show signs of consistent channel forming processes (i.e., have a bed and bank) and are free of vegetation qualify as waters of the U.S., as well as reservoirs constructed on these streams.

In August 1998, field investigations were conducted to verify USFWS NWI maps (1:24,000 scale) of the PAPA. The maps proved to be accurate in depicting the classification and extent of waters of the United States including wetlands. However, some wetland areas identified on the NWI maps, such as irrigated pastures and hayfields, may not be within the COE's jurisdiction or subject to regulation under Section 404 due to a lack of hydric soils, a lack of dominance by hydrophytic vegetation, or artificial hydrology as a result of irrigation.

Although the extent of the wetlands along the New Fork and Green rivers are accurately depicted, the riparian scrub shrub and forested wetland types appear to be under-represented in the project area by the NWI maps. It was noted that some areas that have the appearance of a scrub shrub community are often classified as wet meadows and the forested areas (i.e., cottonwoods) are classified as scrub shrub wetland types.

Wetland locations in the PAPA, based on NWI mapping, are shown on Figure 3-17. Table 3-31 lists the acres of these wetlands in the project area by

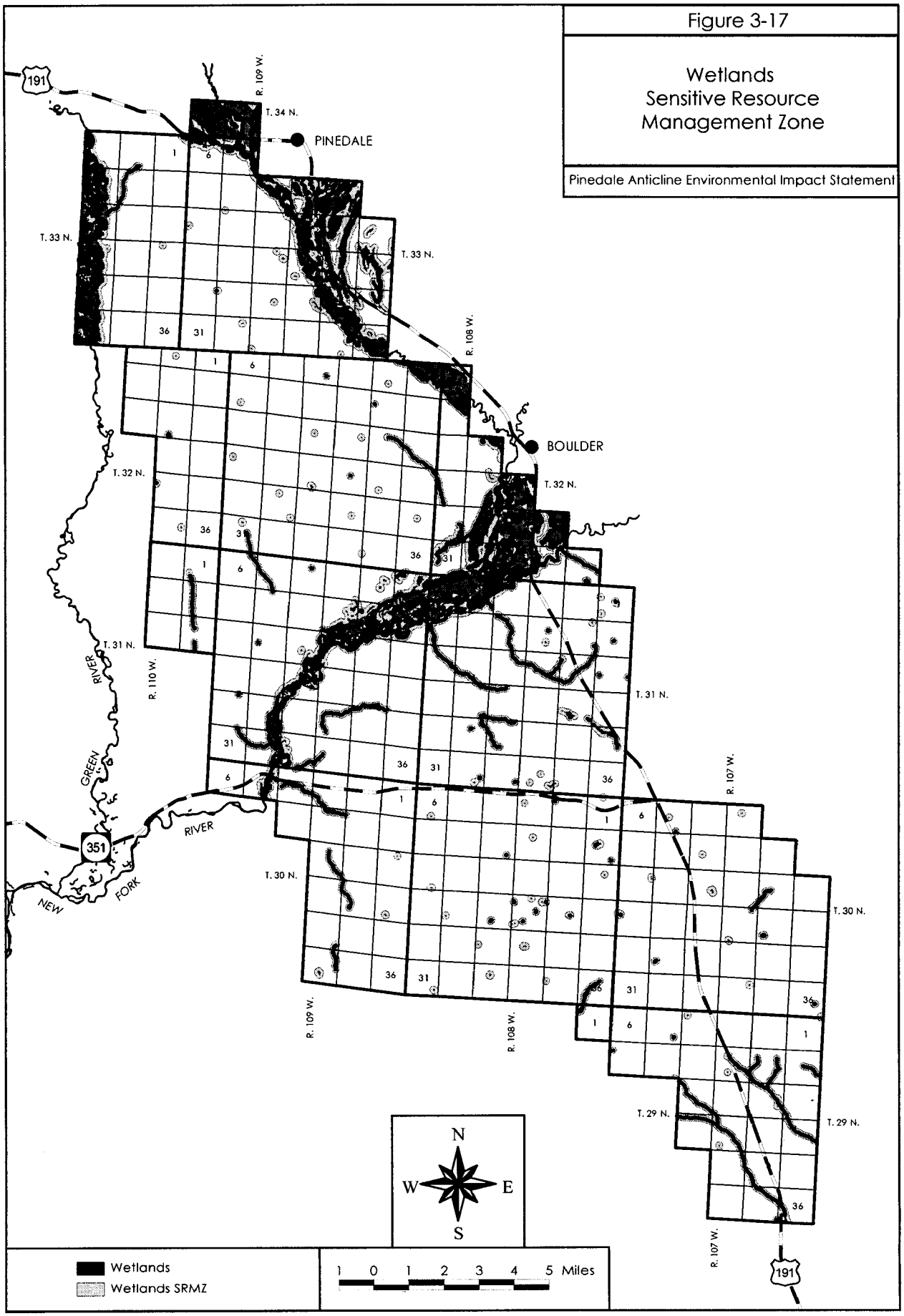


Figure 3-17
Wetlands
Sensitive Resource
Management Zone
Pinedale Anticline Environmental Impact Statement
191
PINEDALE
BOULDER
T. 34 N.
T. 33 N.
T. 32 N.
T. 31 N.
T. 30 N.
T. 29 N.
R. 109 W.
R. 108 W.
R. 107 W.
R. 110 W.
GREEN RIVER
NEW FORK RIVER
351
N
S
E
W
Wetlands
Wetlands SRMZ
1 0 1 2 3 4 5 Miles

Table 3-31
Wetland Cover Type Acreage in the Project Area (1)

Wetland Cover Type	Cowardian Classification (2)	Total Wetland (acres)	Percent of Total Wetlands
Wet meadow	Palustrine emergent temporarily and seasonally flooded	7,474.5	66.4
Aquatic bed	Palustrine aquatic bed semi-permanently flooded	261.1	2.3
Stock ponds	Palustrine unconsolidated bottom and shore; palustrine emergent	12.2	0.1
Riparian scrub shrub	Palustrine scrub shrub	2,669.4	23.7
Riverine	Riverine lower perennial unconsolidated bottom and unconsolidated shore; riverine upper perennial unconsolidated shore	840.5	7.5
Total		11,257.7	100.0

1 = Source USFWS NWI maps.
2 = Cowardian (*et al.* 1979). Palustrine is shallow ponds, marshes, swamps, and sloughs; emergent is rooted, herbaceous plants, excluding mosses and lichens; scrub shrub is woody vegetation less than 20 feet tall; unconsolidated bottom is wetlands with at least 2.5 percent cover of particles smaller than stones, typically less than 10 inches, for example, cobble, gravel, sand and mud; unconsolidated shore is wetlands having unconsolidated substrates with less than 75 percent cover of stones, boulders and bedrock, includes beaches, bars and flats.

type. Wetlands occupy approximately 5.7 percent of the total PAPA acreage with most of the wetlands occurring along the flood plains of the Green and New Fork rivers. Approximately 10,796 acres of wetlands (96 percent) occur on private and state lands and minerals.

Wet Meadow. This type accounts for approximately 66 percent of the wetlands within the PAPA and includes Cowardian classifications of palustrine emergent both temporarily flooded and seasonally flooded. Most of the wet meadow wetlands are associated with the Green and New Fork rivers. The majority of this wet meadow is in the form of subirrigated hay fields along these waterways. Typical plant species found in this type include beaked sedge, Nebraska sedge, woolly sedge, spikerush, swordleaf rush, meadow foxtail, Tufted hairgrass, creeping bentgrass, Kentucky bluegrass and reed canarygrass, Pacific aster, red clover, strawberry clover and willowherb. This type includes all of the irrigated hay fields and pastures above the New Fork River's flood plain that may not be jurisdictional wetlands.

Aquatic Bed. This type comprises about 2 percent of the wetlands found within the PAPA. This wetland type represents the Cowardian classification of palustrine aquatic bed. Aquatic bed wetlands are areas which support standing water less than 6 feet deep nearly all year long. Within the PAPA, aquatic bed wetlands are found primarily in oxbows of old river channels along the Green and New Fork rivers. However, many of the stock ponds in the PAPA have been mapped as this type. Typical plant species found in this type include cattails, rushes, sedges, canarygrass and duckweed.

Stock Ponds. The stock pond type accounts for about 0.1 percent of the wetlands within the PAPA. Many of the stock ponds in the PAPA have also been mapped in the wet meadow and aquatic bed types. This type represents the Cowardian classifications of palustrine unconsolidated bottom and palustrine unconsolidated shore both temporarily and seasonally flooded. Stock ponds are man-made excavations and small dams constructed along intermittent stream channels and are important water sources for both wildlife and livestock. The stock ponds are distributed throughout the PAPA. Depending on the amount and duration of water held by the stock pond, the perimeter of the pond may support wet meadow plant species. Foxtail barley is a typical plant species in this type.

Riparian Scrub Shrub. The riparian scrub shrub type accounts for about 24 percent of the wetlands within the PAPA. This wetland type represents the Cowardian classification of palustrine scrub shrub broad-leaved deciduous. This type is primarily associated with riparian areas adjacent to the Green and New Fork rivers. Typical plant species found in this type include narrowleaf cottonwood, sandbar and

Geyer willow, shrubby cinquefoil, rose and silver sagebrush.

Based on field verification of the NWI maps within the PAPA, the riparian forested type appears to have been classified in with the riparian scrub shrub type and is not represented in the PAPA. There are areas in the PAPA along the Green and New Fork rivers that have an overstory of cottonwoods but were not classified as palustrine forested broad-leaved deciduous. This riparian forested type is important habitat for beavers and migrating species including bald eagles and other raptors. Many of the raptors found in the project area nest only in this wetland type. Much of this habitat constitutes crucial winter range for moose.

Riverine. This type makes up about 7 percent of the wetlands within the PAPA. This wetland type primarily represents the Cowardian classification of riverine lower perennial with unconsolidated bottoms and shores that are temporarily or seasonally flooded. Minor amounts of riverine upper perennial unconsolidated shore are also present on Pine Creek within the PAPA. These types are located on perennial drainage channels that show signs of consistent channel forming processes (i.e., are at bed and grade) and are free of vegetation.

The proposed sales pipeline would cross wetlands that are either excavated areas likely used for stock ponds or ephemeral drainages other than at the Green River and Blacks Fork crossings. At the proposed sales gas pipeline crossing of the Green River, cottonwood and willow riparian areas are found. At the Blacks Fork the vegetation consists of willow, hawthorn, low shrubs and lowland grasses (BLM, 1998a). At the Blacks Fork, the pipelines would cross temporarily flooded palustrine wetlands. At the Green River crossing, wetlands would not be affected.

Wetlands in the project area are considered important habitat for many wildlife species. In addition, the wetlands are essential to maintaining water quality in area streams. A national policy has been adopted that requires no net loss of wetlands. As such, all wetlands in the project area have been identified as sensitive resource management zones. Consistent with BLM's current policy to protect a 500 foot buffer from wetland boundaries, the Wetland SRMZ includes 500 feet from any wetland. The Wetland SRMZ is shown on Figure 3-17.

100-year Flood Plains. The 100-year flood plains that occur in the PAPA are shown on Figure 3-18. According to maps prepared by FEMA, there are 10,936 acres of 100-year flood plains in the project area. Most are located on private lands. On Federal lands and minerals, approximately 1,785 acres of 100-year flood plain have been mapped by FEMA. On private lands, the flood plains are used for hay production and cattle grazing.

Sublette County's Zoning and Development Regulations specifically address development in flood areas (Chapter III, Section 13). The county regulations define a floodway as *"that area of the county, including the channel of any water course, stream or river, required to effectively carry and discharge flood waters, that is inundated by the ten year recurrence interval flood."*

The county's development standards prohibit the placement of any structures in any floodway. In flood areas, where ground water level is within 4 feet of the surface, all structures and site improvements must be designed to minimize groundwater pollution or contamination.

Because of concerns about development in flood areas, the Flood Plain SRMZ has been mapped to include the entire 100-year flood plain in the project area. This SRMZ is shown on Figure 3-18.

3.19 Threatened and Endangered Species and Special Status Species

3.19.1 RMP Management Objective. The RMP states that threatened and endangered species and their habitats will be protected. Actions which would degrade habitat to a point of jeopardizing the continued existence of a threatened or endangered species will not be allowed. Key potential threatened and endangered species habitats identified in the RMP includes cottonwood stands along the Green and New Fork rivers. These cottonwood stands were recognized as providing potential habitat for bald eagles.

3.19.2 Affected Environment. In 1998 the USFWS (Appendix C, Letter 3) identified 4 Federally-listed threatened and endangered species that could

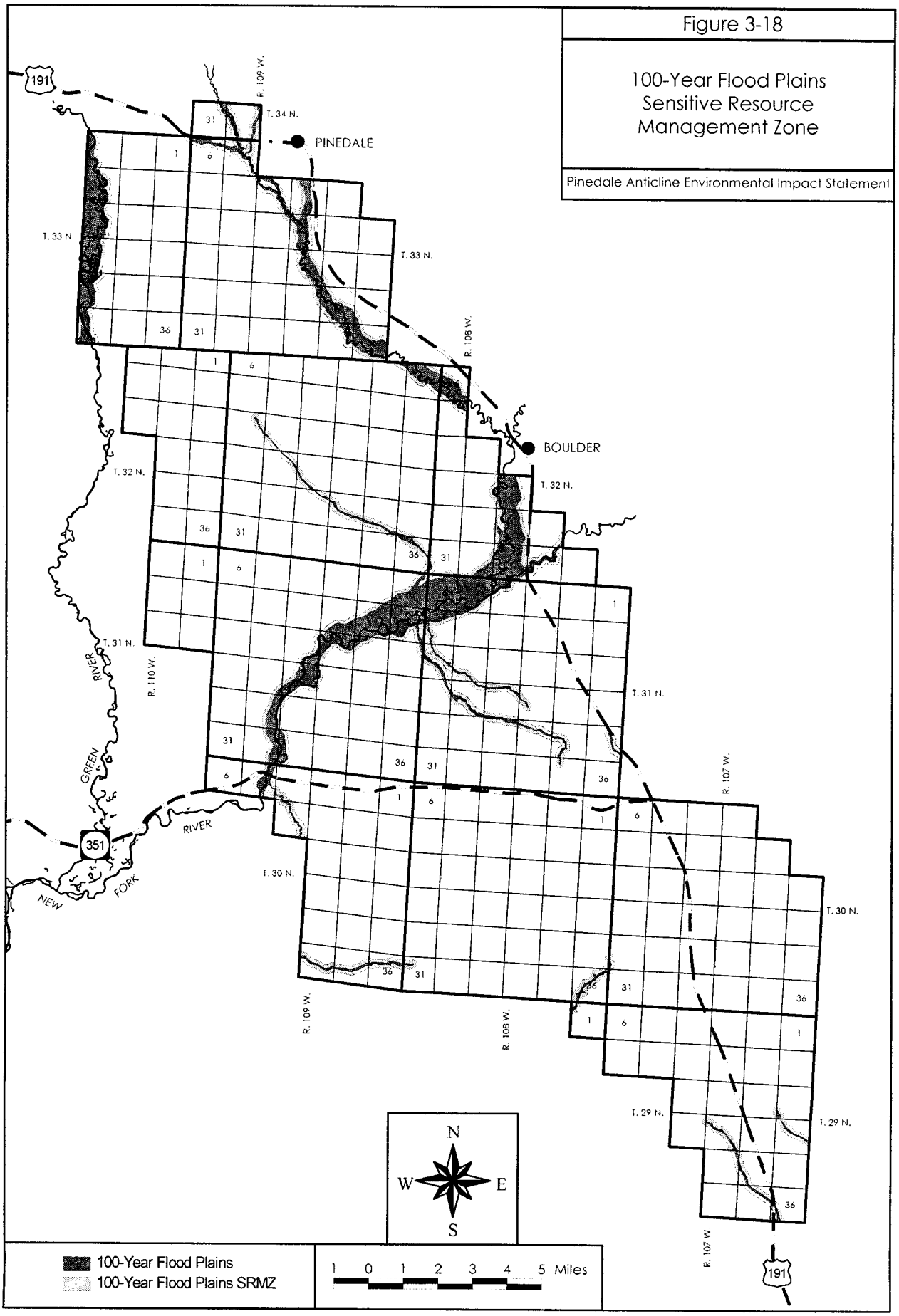


Figure 3-18
100-Year Flood Plains
Sensitive Resource
Management Zone
Pinedale Anticline Environmental Impact Statement
191
PINEDALE
BOULDER
T. 34 N.
T. 33 N.
T. 32 N.
T. 31 N.
T. 30 N.
T. 29 N.
R. 109 W.
R. 108 W.
R. 110 W.
R. 107 W.
GREEN RIVER
NEW FORK RIVER
351
N
W
E
S
100-Year Flood Plains
100-Year Flood Plains SRMZ
1 0 1 2 3 4 5 Miles

potentially occur in the PAPA. Those were the black-footed ferret (endangered), peregrine falcon (endangered), whooping crane (endangered) and bald eagle (threatened). In 1999, the USFWS provided correspondence (Appendix C, Letter 5) with an update of Federally-listed species that could occur, including the black-footed ferret, bald eagle, mountain plover (proposed for listing as threatened) and Canada lynx (proposed for listing as threatened) but omitting the whooping crane and peregrine falcon. The peregrine falcon was removed from the Federal List of Endangered and Threatened Wildlife in August, 1999 and the bald eagle has been proposed for removal. USFWS also noted that if development activities result in water depletion of the Green River-Colorado River System, effects to 4 additional species should be evaluated: Colorado squawfish, humpback chub, bonytail chub and razorback sucker all of which are endangered fish of the Green River System. No listed threatened or endangered plants have been reported in the PAPA by either USFWS (1999) or Wyoming Natural Diversity Database (WNDDB, 1998). But, USFWS identified one additional wildlife species, swift fox (candidate), that might be in the project area.

Black-footed Ferret. Black-footed ferrets' original distribution in North America closely corresponded to distributions of prairie dogs (Hall and Kelson, 1959; Fagerstone, 1987) and until 1985, a free-living population inhabited white-tailed prairie dog colonies located west of Meeteetse, Wyoming. This population was reduced by canine distemper in 1985 (Clark, 1985) and surviving ferrets were captured for captive breeding and eventual reintroduction to the wild. Black-footed ferrets depend on prairie dogs for food and prairie dog burrows for shelter (Hillman and Clark, 1980 and Fagerstone, 1987). They are mostly nocturnal and spend much of their time underground so their presence in an area is difficult to confirm. Black-footed ferrets breed from mid-March through early April (Clark and Stromberg, 1987) and young are born in prairie dog burrows. Young ferrets venture above ground during July but remain near the nest burrow (Fagerstone, 1987). Several white-tailed prairie dog colonies have been located and mapped within the PAPA by WGFD in the 1980's and were recently re-mapped.

According to available information compiled by Clark (1978), the WGFD (Kinter and Martin, 1992), USFWS (1991) and WNDDB (1998), there have been 3 positive or confirmed and numerous unverified reports of black-footed ferrets in the vicinity of the PAPA. Only one of these, a record from 1930, was noted as physical evidence - a ferret trapped near Farson (Clark, 1978). Three prairie dog towns were surveyed for ferrets in July of 1999. No ferrets were found. This survey was done in conjunction with the Veritaz seismic survey. A survey for black-footed ferrets was also conducted during 1988-1989. No ferrets or ferret sign were observed.

Peregrine Falcon. The USFWS determined that the American peregrine falcon is no longer endangered or threatened and removed the species from the Federal List of Endangered and Threatened Wildlife on August 25, 1999.[1]

Bald Eagle. One bald eagle nest is within the PAPA and has been successful in 1997, 1998 and 1999 in producing offspring. Bald eagles typically begin nest building and laying eggs in February while incubation may last until May. Young usually fledge by early July (Call, 1978). Nests are usually constructed in mature or old-growth trees, often with broken tops and strong limbs sufficient to support a large stick nest although eagles will occasionally nest on the ground on isolated, treeless islands and on cliffs (Peterson, 1986). Nesting territories are usually close to water where food sources such as fish and waterfowl are available (Greater Yellowstone Ecosystem Bald Eagle Working Team, 1983; Roderick and Milner, 1991).

Bald eagles also utilize the New Fork River and Green River corridors during winter, typical of bald eagles wintering in the Greater Yellowstone Ecosystem (GYE) (GYE Bald Eagle Working Team, 1983). During winter, bald eagles commonly utilize communal roosts and several roost sites, also in cottonwoods, have been identified south of the PAPA, along the Green River. All evidence indicates that communal roosts used by wintering bald eagles at night are in trees that provide relatively optimum shelter from wind and low ambient temperatures (Steenhof *et al.*, 1980; Anthony *et al.*, 1982; Anderson and Patterson, 1988). Ungulate carrion is an important winter food and it is possible that bald eagles feed on big game carcasses on local winter ranges.

[1] See Federal Register: August 25, 1999, 64(164):46541-46588

A portion of the sales pipeline corridor is adjacent to a bald eagle foraging and potential nesting and roosting area within Seedskadee National Wildlife Refuge. The pipeline crossing of the Green River is within 1 mile of an eagle nest that was last active in 1995 (BLM, 1998a).

Whooping Crane. Until several years ago, whooping cranes had established summer range west of Big Piney and 2 others occasionally were seen along the upper Green River near Merna and Cora (Ritter, 1990). These birds were from the experimental flock from the Grays Lake National Wildlife Refuge in Idaho, which was initiated in 1975 as an experiment to cross-foster whooping crane eggs in nests of sandhill cranes (USFWS, 1986). The cross-fostering program was discontinued in 1989 and there have been no records of whooping cranes along the Green River in Wyoming since 1985, although a whooping crane-sandhill crane hybrid was observed in the vicinity of Farson until several years ago. There were only 13 birds from the Grays Lake flock known to be alive in March 1990 (Ritter, 1990) and only 4 remained in 1995 (USFWS, 1996).

The general habitat utilized by whooping cranes in Wyoming includes marshes, wet meadows, and grain fields near water (Dorn and Dorn, 1990). Whooping cranes occurred along the upper Green River in the early 1980s during spring and fall migrations. However, all designated critical habitat in Idaho, Colorado, and New Mexico has been withdrawn and any whooping cranes occurring in Wyoming are part of a nonessential experimental population (USFWS, 1996). Occurrence of whooping cranes within or near the PAPA becomes more unlikely as the experimental population dwindles.

The USFWS designated the Rocky Mountain population of whooping cranes as experimental and nonessential in 1997[2]. As a nonessential experimental population, the potential presence of whooping cranes from the Grays Lake population do not require formal consultation with the USFWS but Federal programs are required to conserve the species nevertheless.

Fish Species. Four species of endangered fish historically inhabited the Green River drainage but their present distribution is probably limited to portions of the river downstream from Flaming Gorge Dam. The species are the bonytail chub, humpback chub, Colorado squawfish, and razorback sucker. They are adapted to large, deep, turbid, and swift-flowing rivers in the Colorado and Green River drainages where they inhabit shaded pools and eddies (humpback chub and Colorado squawfish) or deep, swift-moving water in channels (bonytail chub and razorback sucker) in the middle and upper Colorado and Green rivers in Utah, Colorado, and Arizona (Joseph *et al.*, 1977; Lee *et al.*, 1980; Woodling, 1985). None of these species is likely to occur in the Green River upstream from Flaming Gorge Dam and construction of the dam has been cited as the principal demise of these species in Wyoming (Baxter and Stone, 1995; Joseph *et al.*, 1977). The presence of dams and reservoirs in the Colorado River system reduced flows and turbidity that the species had adapted to and caused increased water temperatures, conditions to which introduced species were better adapted (Joseph *et al.*, 1977). These and other native species were also affected by in-stream and stream side habitat changes brought about by livestock grazing, mining, forestry, channelization, and water diversion projects (Joseph *et al.*, 1977).

Proposed Wildlife Species. Mountain plovers, recently proposed for listing, have been associated with prairie dog towns where vegetation has been reduced (Knowles *et al.*, 1982; Olson-Edge and Edge, 1987; Parrish, 1988; Dinsmore, 1983; Knopf and Miller, 1994). They nest in areas of low herbaceous vegetation, reduced shrub cover, and near prominent objects such as cow-manure piles or similar-sized rocks (Graul 1975, Knopf and Miller, 1994). There have been recent reports of mountain plovers in Sublette County and the PAPA. Two separate sightings of plovers were made in 1999 while mapping prairie dog towns in the PAPA. It is likely that they also occur in the project area in salt desert shrub vegetation between Blue Rim and the North Fork River.

Canada lynx in the contiguous United States were proposed for listing as threatened in 1998[3]. Since then, the USFWS has extended their evaluation of the proposed rules until January 8, 2000[4]. A population of Canada lynx exists west of the PAPA in the Wyoming Range and have been seen north, in the upper Green River drainage and vicinity of Togwotee Pass (Laurion and Oakleaf, 1998). Both historical

[2] See Federal Register July 21, 1997, 62(139): 38932-38939.

[3] See Federal Register July 8, 1998, 63(130): 36993-37013.

[4] See Federal Register July 8, 1999, 64(130): 36836-36837

and recent observations of lynx in those areas have mostly been in spruce-fir and lodgepole pine habitats (Reeve, *et al.*, 1986; Laurion and Oakleaf, 1998) which do not occur on or near the PAPA. While their occurrence on the PAPA is unlikely, lynx could move through the area especially as juveniles that might disperse from distant population centers (Reeve *et al.*, 1986). However, such occurrences are impossible to predict as are potential impacts due to any of the project alternatives.

Candidate Wildlife Species. The swift fox, a candidate for listing as endangered or threatened under the Endangered Species Act, is found in short-grass and midgrass prairies over much of the Great Plains. In Wyoming, recent surveys conducted in central and eastern Wyoming did not include Sublette County and historical distributions of swift fox did not include that area (Woolley *et al.*, 1995). Swift fox were found in eastern Sweetwater County. In northeastern Colorado, this fox appears to be most numerous in areas with relatively flat to gently rolling terrain (Cameron, 1984 and Loy 1981) and rare in terrain that is highly eroded with gullies, washes, and canyons (Fitzgerald, 1994), contrary to many observations made in Wyoming (Woolley *et al.*, 1995). In many areas, cottontails and jackrabbits constitute a bulk of their diet (Cameron, 1984; Zumbaugh *et al.*, 1985) and Fitzgerald (1994) noted that swift fox population will decline during periods of low rabbit densities. Covell and Rongstad (1990) have suggested that high coyote densities may serve to limit swift fox numbers. That, and the fact that they are quite easy to trap, undoubtedly contributes to mortality; coyotes inhabiting the PAPA may preclude use by swift fox.

Species with Special Status. Many species are known to occur or potentially occur in the vicinity or within the PAPA and have been designated with special status, whether by the USFWS, BLM, WGFD, and/or WNDDB. These species are listed in Table 3-32. Species listed as Federal threatened, endangered, or candidate species are not included in Table 3-32 but are discussed, above.

Animal Species with Special Status. Of the 10 species of mammals listed in Table 3-32 with special status, only 2, fringed myotis and pygmy rabbit, have been documented in Sublette County or the PAPA. However, 16 of the 29 bird species have been documented by at least one source as occurring in the county, both species of amphibians occur, and all 5 species of special status fish occur in Sublette County, if not in the project area.

Plant Species with Special Status. BLM policy and guidance requires the use of all methods and procedures necessary to eliminate any threat to the continued existence of these species. Eleven special status plant species are either known or potentially occur in the PAPA (Table 3-32). Fertig (1998) lists 8 of 10 species occurring in the southwest portion of the project area. On-site field inventories and existing literature by Hartman and Nelson (1993), Kass (1995), Cramer and Hartman (1996), Cramer (1997), and Fertig (1998) indicated cushion and badland plant communities as relatively unique vegetation types where most special status plant species can be found in the PAPA.

Rare Plant Habitats

Cushion Plant Communities. Big Piney milkvetch is found on sparsely vegetated rims in cushion plant communities on the Mesa and Burma Peak. Beaver Rim phlox, which co-occurs with Big Piney milkvetch, is also expected to be found in cushion plant communities on uppermost slopes and rims of the project area. Both of these species are also found within openings of Wyoming or black sagebrush and can be very abundant at a particular location. Desert cryptantha and compact gilia, also cushion plant components, are much less abundant and appear to be restricted to chalky barren slopes or edges of Gardner saltbush/fringed sagebrush (Fertig 1998). Both compact gilia and desert cryptantha have a possible chance of occurrence in the vicinity of North Alkali Draw, Blue Rim, and Burma Peak.

Badland Plant Communities. Barren clay shale outcrops (badlands) and slopes are habitat for the large-fruited bladderpod, Payson's beardtongue, desert glandular phacelia, and Nelson phacelia. These habitats are well-represented in North Alkali Draw, Blue Rim, and Burma Point areas. Fertig (1998) comments on these populations being highly localized and relatively small in the Ross Butte ecosystems, located just west of the project area. Opal phlox is often found in barren clay-shale flats, but is more typical of washes and flats dominated by greasewood, Wyoming sagebrush, or Gardner saltbush. These habitats are typically represented in the North Alkali Draw and Burma Peak areas. Rosy

Table 3-32
Animal and Plant Species with Special Status that are Known to Occur or Potentially Occur in the Project Area

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats on PAPA	Source
Mammals				
Vagrant Shrew (*Sorex vagrans*)	WGFD-SSC3	unknown	riparian shrub-meadows, marsh, sagebrush-grasslands	Luce *et al.*, 1997
Western Small-footed Myotis (*Myotis cilliolabrum*)	USFWS-SC; WGFD-SSC3	unknown	basin-prairie shrublands, sagebrush-grasslands	Luce *et al.*, 1997
Long-eared Myotis (*Myotis evotis*)	USFWS-SC; WGFD-SSC2	unknown	cottonwood-riparian, basin-prairie shrublands, sagebrush-grasslands	Luce *et al.*, 1997
Little Brown Myotis (*Myotis lucifugus*)	WGFD-SSC3	unknown	riparian shrub, sagebrush-grasslands near water	Luce *et al.*, 1997
Fringed Myotis (*Myotis thysanodes*)	USFWS-SC; WGFD-SSC2	WNDDB record-County	basin-prairie shrublands	Luce *et al.*, 1997; WNDDB, 1998
Long-legged Myotis (*Myotis volans*)	USFWS-SC; WGFD-SSC2	unknown	prairie and mountain-foothills shrublands	Luce *et al.*, 1997
Big Brown Bat (*Eptesicus fuscus*)	WGFD-SSC3	unknown	basin-prairie shrublands, grasslands, urban areas	Luce *et al.*, 1997
Townsend's Big-eared Bat (*Plecotus townsendii*)	USFWS-SC; WGFD-SSC2	unknown	desert grasslands, basin-prairie shrublands	Luce *et al.*, 1997
Pygmy Rabbit (*Brachylagus idahoensis*)	USFWS-SC; WGFD-SSC3	WNDDB record-PAPA	dense, tall sagebrush along intermittent streams or in sagebrush-grasslands	Luce *et al.*, 1997
Water Vole (*Microtus richardsoni*)	WGFD-SSC3	unknown	foothills grasslands adjacent to streams	Luce *et al.*, 1997
Birds				
Common Loon (*Gavia immer*)	USFWS-SC; WGFD-SSC1	WNDDB record-county	lakes above 6,000 feet	Luce *et al.*, 1997; WNDDB, 1998
American Bittern (*Botaurus lentiginosus*)	USFWS-SC; WGFD-SSC3	unknown	marshes	Luce *et al.*, 1997
Great Blue Heron (*Ardea herodias*)	WGFD-SSC4	observed-PAPA; WNDDB record-county	cottonwood riparian; rookery at confluence of Boulder Creek with the New Fork River	Luce *et al.*, 1997; WNDDB, 1998
Snowy Egret (*Egretta thula*)	WGFD-SSC3	unknown	marshes	Luce *et al.*, 1997
Black-crowned Night-Heron (*Nycticorax nycticorax*)	WGFD-SSC3	unknown	willow shrubs, marshes	Luce *et al.*, 1997
White-faced Ibis (*Plegadis chihi*)	USFWS-SC; WGFD-SSC3	observed-PAPA	marshes, wet meadows, irrigated meadows; groups have been observed in the project area along the New Fork River between Pinedale and the airport	Luce *et al.*, 1997

Table 3-32
Continued

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats on PAPA	Source
Birds				
Trumpeter Swan (*Cygnus buccinator*)	USFWS-SC; WGFD-SSC2	WNDDB record-county	marshes, lakes, rivers	Luce *et al.*, 1997
Harlequin Duck (*Histrionicus histionicus*)	WGFD-SSC3	WNDDB record-county	mountain lakes, rivers-no habitat in PAPA	Luce *et al.*, 1997; WNDDB, 1998
Northern Harrier (*Circus cyaneus*)	USFWS-SC	observed-PAPA	basin-prairie shrublands, grasslands, marshes	Luce *et al.*, 1997
Northern Goshawk (*Accipiter gentilis*)	USFWS-SC; WGFD-SSC4	WNDDB record-county	coniferous, aspen forests-no habitat in PAPA	Luce *et al.*, 1997; WNDDB, 1998
Ferruginous Hawk (*Buteo regalis*)	USFWS-SC; WGFD-SSC3	observed-PAPA	basin-prairie shrublands, rock outcrops, cottonwood-riparian	Luce *et al.*, 1997
Merlin (*Falco columbarius*)	WGFD-SSC3	NBS/BBS record-county; WNDDB record-county	moist habitats below 8,500 feet	Luce *et al.*, 1997; Sauer *et al.*, 1997; WNDDB, 1998
Long-billed Curlew (*Numenius americanus*)	USFWS-SC; WGFD-SSC3	NBS/BBS record-county; WNDDB record-county	sagebrush-grasslands; wet-moist meadow grasslands, irrigated native hay meadows	Luce *et al.*, 1997; Sauer *et al.*, 1997; WNDDB, 1998
Burrowing Owl (*Athene cunicularia*)	USFWS-SC; WGFD-SSC4	observed-PAPA	grasslands, basin-prairie shrublands, agricultural areas	Luce *et al.*, 1997
Great Gray Owl (*Strix nebulosa*)	WGFD-SSC4	WNDDB record-county	coniferous forests, mountain-foothills grassland	Luce *et al.*, 1997; WNDDB, 1998
Short-eared Owl (*Asio flammeus*)	USFWS-SC	unknown	basin-prairie shrublands, grasslands, marshes, irrigated native hay meadows	Luce *et al.*, 1997
Lewis' Woodpecker (*Melanerpes lewis*)	WGFD-SSC3	unknown	cottonwood-riparian below 8,500 feet	Luce *et al.*, 1997
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	USFWS-SC	unknown	cottonwood-riparian	Luce *et al.*, 1997
Gray Flycatcher (*Empidonax wrightii*)	USFWS-SC	unknown	basin-prairie and mountain-foothills shrublands	Luce *et al.*, 1997
Ash-throated Flycatcher (*Myiarchus cinerascens*)	WGFD-SSC3	unknown	basin-prairie shrublands	Luce *et al.*, 1997
Veery (*Catharus fuscescens*)	USFWS-SC; WGFD-SSC4	unknown	cottonwood-riparian forests below 9,000 feet	Luce *et al.*, 1997

Table 3-32
Continued

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats on PAPA	Source
Birds				
Loggerhead Shrike (*Lanius ludovicianus*)	USFWS-SC	NBS/BBS record-county	greasewood flats, prairie and mountain-foothills shrublands	Luce *et al.*, 1997; Sauer *et al.*, 1997
Orange-crowned Warbler (*Vermicorva celata*)	WGFD-SSC4	unknown	cottonwood-riparian	Luce *et al.*, 1997
American Redstart (*Seophaga ruticilla*)	WGFD-SSC4	unknown	cottonwood-riparian, riparian shrub	Luce *et al.*, 1997
Common Yellowthroat (*Geothlypis trichas*)	WGFD-SSC4	NBS/BBS record-county	willow and marshes below 8,000 feet	Luce *et al.*, 1997; Sauer *et al.*, 1997
Brewer's Sparrow (*Spizella breweri*)	USFWS-SC	NBS/BBS record-county	basin-prairie sagebrush shrublands	Luce *et al.*, 1997; Sauer *et al.*, 1997
Lark Bunting (*Calamospiza melanocorys*)	USFWS-SC	NBS/BBS record-county	basin-prairie shrublands, basin-foothills grasslands	Luce *et al.*, 1997; Sauer *et al.*, 1997
Grasshopper Sparrow (*Ammodramus savannarum*)	USFWS-SC; WGFD-SSC4	NBS/BBS record-county	basin-prairie shrublands, wet-moist meadow grasslands	Luce *et al.*, 1997; Sauer *et al.*, 1997
Chestnut-collared Longspur (*Calcarius ornatus*)	USFWS-SC	unknown	basin-prairie shrublands, agricultural area	Luce *et al.*, 1997
Reptiles and Amphibians				
Western Boreal Toad (*Bufo boreas boreas*)	USFWS-SC	WNDDB record-county	wet areas in foothills, 8,000-11,000 feet-no habitat in PAPA	Luce *et al.*, 1997; WNDDB, 1998
Columbia Spotted Frog (*Rana luteiventris (pretiosa)*)	USFWS-SC	WNDDB record-county	ponds, sloughs, small streams in foothills	Luce *et al.*, 1997; WNDDB, 1998
Eastern Short-horned Lizard (*Phrynosoma douglassi breviriostre*)	USFWS-SC	unknown	grasslands, sagebrush communities	Luce *et al.*, 1997
Northern Sagebrush Lizard (*Sceloporus graciosus graciosus*)	USFWS-SC	unknown	rock outcrops in sagebrush and semi-arid shrublands	Luce *et al.*, 1997
Fish				
Roundtail Chub (*Gila robusta*)	USFWS-SC	WNDDB record-county	main currents of Green River	WNDDB, 1998
Bluehead Sucker (*Catostomus discobolus*)	USFWS-SC	WNDDB record-county	main currents and tributaries to Green River	WNDDB, 1998
Flannelmouth Sucker (*Catostomus latipinnis*)	USFWS-SC	WNDDB record-county	pools and eddies in main channels of Green River	WNDDB, 1998

Table 3-32
Continued

Common Name/Scientific Name	Status (1)	Local Occurrence (2)	Expected Habitats on PAPA	Source
Fish				
Colorado River Cutthroat Trout (*Oncorhynchus clarki pleuritcus*)	USFWS-SC	WNDDB record-county	upper reaches of tributary streams	WNDDB, 1998
Plants				
Big Piney Milkvetch (*Astragalus drabelliforims)*	USFWS-SC; BLM-SS; WNDDB-S2S3	observed-PAPA	vegetated rims of cushion plant communities and gravelly slopes and flats	Fertig, 1998
Rosy Pussy-paws (*Calyptridium roseum)*	WNDDB-S1	observed-PAPA	sandy sagebrush habitats	Fertig, 1998
Cedar Rim Thistle (*Cirsium aridum*)	WNDDB-S2; BLM-SS	WNDDB record-county	shallow barren draws with sandy soils with cushion plant communities	WNDDB, 1998
Desert Cryptantha (*Cryptantha scoparia)*	WNDDB-S2	possible	cushion plant communities with chalky barren slopes	Fertig, 1998
Compact Gilia (*Ipomopsis crebrifolia*)	WNDDB-S2S3	observed-PAPA	cushion plant communities and in openings of Wyoming big sagebrush	Fertig, 1998
Large-fruited Bladderpod (*Lesquerella macrocarpa)*	USFWS-SC; BLM-SS; WNDDB-S2	observed-PAPA	barren clay knolls at the base of shale-siltstone ridges with Gardner saltbush	Fertig, 1998
Payson's Beardtongue (*Penstemon paysoniorum)*	WNDDB-S3	observed-PAPA	sandy or clay shale badland slopes, in Wyoming big sagebrush on slopes of silty clays below caprock	Fertig, 1998
Desert Glandular Phacelia (*Phacelia glandulosa* var *deserta)*	WNDDB-S1	possible	open slopes and badlands with intermittent sagebrush	Fertig, 1998
Nelson's Phacelia (*Phacelia salina*)	WNDDB-S1	observed-PAPA	purplish clay-shale barrens in sparse Gardner saltbush	Fertig, 1998
Opal Phlox (*Phlox opalensis*)	USFWS-SC; WNDDB-S3	observed-PAPA	barren clay-shale slopes and flats, washes and flats dominated by greasewood, Wyoming big sagebrush or Gardner saltbush	Fertig, 1998
Beaver Rim Phlox (*Phlox pungens* (Ross Butte morph))	USFWS-SC; BLM-SS; WNDDB-S2	observed-PAPA	vegetated rims in cushion plant communities	Fertig, 1998

Table 3-32
Concluded

1 = Status:

USFWS-SC: US Fish and Wildlife Service species of concern.

WGFD-SSC1, 2, 3 or 4: Wyoming Game and Fish Department Species of Special Concern (Oakleaf *et al.*, 1996). This classification scheme is currently being revised by WGFD.

Priority 1: populations greatly restricted or declining-extirpation appears possible.

Priority 2: populations are declining or restricted in numbers and/or distribution-extirpation not imminent.

Priority 3: species is widely distributed; population status and trends are unknown but are suspected to be stable.

Priority 4: populations are stable or increasing and not restricted in numbers and/or distribution.

BLM-SS: Rock Springs District, BLM sensitive species. Assume all WGFD Species of Concern are BLM sensitive species.

WNDDB-S1, S2, S3: Wyoming Natural Diversity Database State Ranks:

S1 - Critically imperiled in Wyoming because of extreme rarity (5 or fewer occurrence, or very few remaining individuals) or because of some factor of its biology making it especially vulnerable to extinction (critically endangered in state).

S2 - Imperiled in Wyoming because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it very vulnerable to extinction throughout its range (endangered in state).

S3 - Rare in Wyoming (on the order of 20+ occurrences) (threatened in state).

2 = Local Occurrence:

unknown - indicates the species range overlaps in the degree block encompassing the PAPA (Luce *et al.*, 1997) but no specific occurrences are known

WNDDB record - records from Wyoming Natural Diversity Database indicate species is in Sublette County or within the PAPA

NBS/BBS record - records that species occurs on at least 1 of 4 National Biological Survey, Breeding Bird Survey

observed - observed during field surveys

pussy-paws can be expected to be found in sandy sagebrush habitats. It has been located in the project area near Burma Peak (Cramer and Hartman 1996).

No Federally listed plant species occur in the vicinity of the sales pipeline corridor. Field inspections of the Green River crossing area indicate that adequate habitat for Ute ladies' tresses is not present. A variety of BLM and state-sensitive plant species may occur in the vicinity of the pipeline corridor.

3.20 Wildlife and Aquatic Resources

3.20.1 RMP Management Objective. The RMP lists the following as the objective for wildlife habitat: *to the extent practicable, wildlife habitat management will be oriented toward the maintenance of fish and wildlife habitats to support populations at 1987 Wyoming Game and Fish Department planning objective levels. Activity planning will emphasize habitat enhancement and protection. Changes within the Wyoming Game and Fish Department planning objective levels will be considered based on habitat capability and availability.*

The RMP requires that mule deer, elk, antelope, and sage grouse use patterns be monitored. To date, the BLM has lacked funding to conduct such surveys. Monitoring of vegetation and browse has occurred. Ultra, however, has voluntarily initiated a monitoring program for deer, antelope and sage grouse that will eventually lead to a much better understanding of the use patterns for these species. The BLM has approved funding for additional sage grouse monitoring.

3.20.2 Big Game. Four big game species are known to inhabit the PAPA area and vicinity throughout the year. These are pronghorns, mule deer, moose and elk. Also, mountain lions and black bear, both classified as trophy game animals, may occasionally be present as they disperse from more distant population centers.

Pronghorn. Pronghorns are the most abundant big game animal in the PAPA. The area is within Sublette Antelope Herd Unit (HU). The HU encompasses over 10,500 square miles or 11 percent of the state. Pronghorns summering in Grand Teton National Park may migrate 150 miles to southern winter ranges near I-80, farther than other pronghorns in North America (Christiansen, 1998). Finding that there was a significant interchange of animals between the West Green River HU and the Sublette HU, WGFD combined these 2 HUs and subdivided management responsibilities between 3 WGFD administrative regions, Lander, Green River, and Jackson/Pinedale. With the incorporation of the West Green River HU, the Sublette HU population objective is 48,000 animals.

The PAPA is within the north sub-unit of the Sublette HU. It has a population objective of 22,000 pronghorns occupying over 3,312 square miles of habitat and is the area of highest pronghorn density in the HU (see Table 3-33).[5] Pronghorns in the north sub-unit are managed by the Jackson/Pinedale region. This portion of the population has generally increased since 1993 to the current estimate of 18,100 pronghorns in 1997 (McWhirter, 1998a).

During the early 1990's, harvests of does and fawns were increased to regulate the increasing population but the severe winter of 1992-93 and concomitant mortality led to a significant reduction of doe and fawn harvest from 1994 to the present.

Activities proposed for the PAPA are within spring-summer-fall ranges, winter and crucial winter-yearlong range in this herd unit. Crucial winter-yearlong range is present in low density sagebrush found on the southern slopes of the Mesa and south of the New Fork River (see Figure 3-19). A portion of the project area is considered crucial winter-yearlong range and comprises the Antelope SRMZ. In general, pronghorn habitats in the eastern portion of the PAPA (east of US Highway 191) are higher quality than western areas, primarily due to higher precipitation and vegetative productivity, and more available water (McWhirter, 1998a).

Pronghorns migrating south through the PAPA have been hindered by highways, subdivisions, and fences and migration corridors for this segment of the Sublette HU are becoming more restrictive (McWhirter, 1998a). In the past, antelope migrating south immediately west of Pinedale and east of the New Fork River have required assistance in some winters from highway patrol and WGFD including stopping traffic so that the animals could continue migrating south toward the Mesa. Telemetry studies

[5] These are the population objectives on which the RMP is based. WGFD has updated the objectives. The new population objectives will be considered in any RMP revisions.

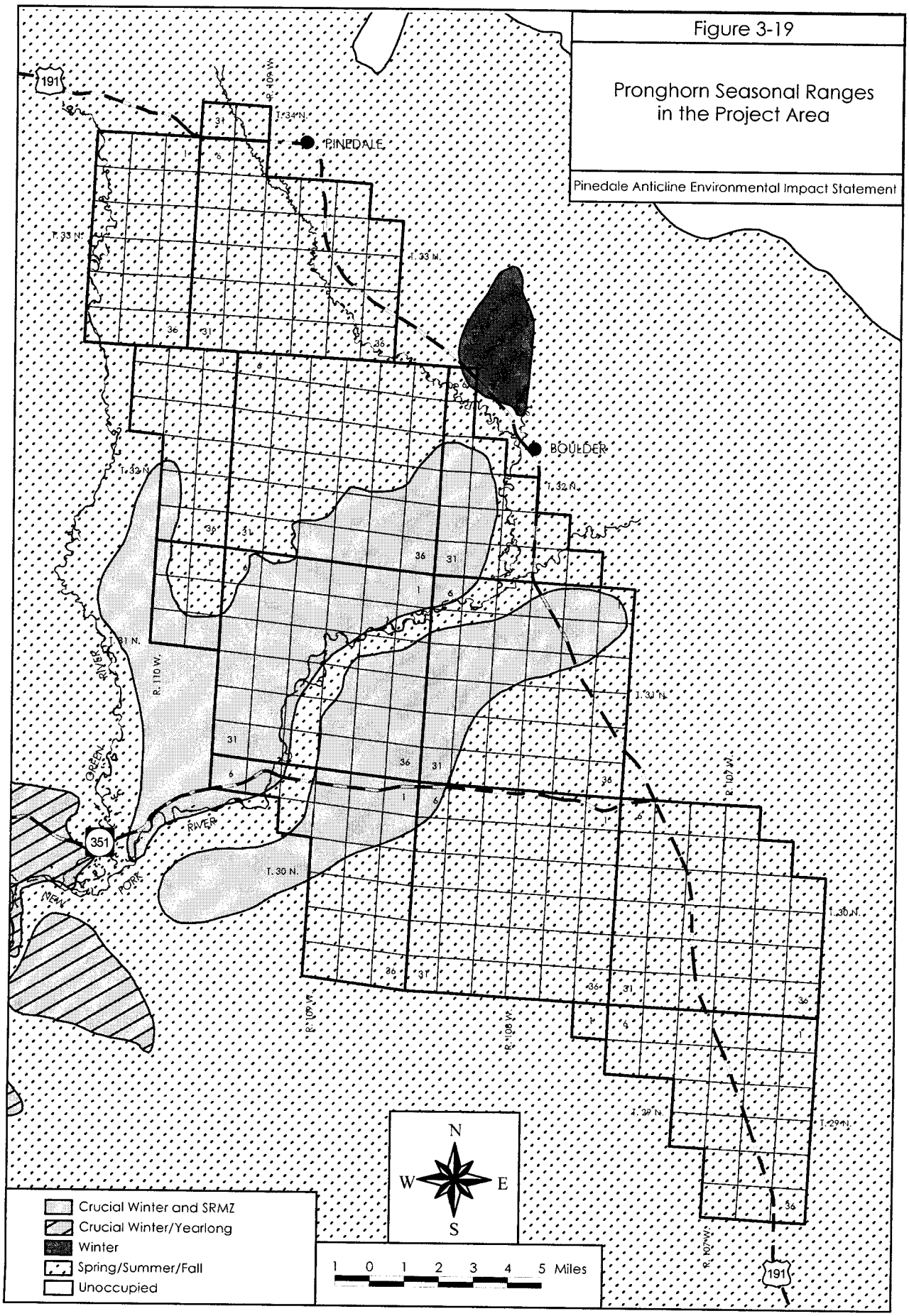


Figure 3-19
Pronghorn Seasonal Ranges in the Project Area
Pinedale Anticline Environmental Impact Statement
PINEDALE
BOULDER
191
351
T. 34 N.
T. 33 N.
T. 32 N.
T. 31 N.
T. 30 N.
T. 29 N.
R. 110 W.
R. 109 W.
R. 108 W.
R. 107 W.
GREEN RIVER
NEW FORK RIVER
N
W
E
S
Crucial Winter and SRMZ
Crucial Winter/Yearlong
Winter
Spring/Summer/Fall
Unoccupied
1 0 1 2 3 4 5 Miles

Table 3-33
Estimated Areas of Big Game Seasonal Ranges in the Project Area

Big Game Species	Herd Unit	Seasonal Range (1)	Acres in the Project Area
Pronghorn	Sublette North Unit	SSF	149,800
		WIN	120
		Crucial WIN	47,426
Mule Deer	Sublette	SSF	34,807
		WYL	14,465
		Crucial WIN	27,220
		BLM WIN	26,131
Moose	Sublette	Crucial WYL	20,073
Elk	Upper Green River	WIN	1,318
		WYL	984

1 = Seasonal Ranges are: SSF, spring-summer-fall; YRL, yearlong; WIN, winter; WYL, winter-yearlong.
Any ranges designated as crucial by WGFD are those areas which determine whether a population maintains and reproduces itself at or above the WGFD population objective over the long-term (Wildlife Society, 1990): WYL: Winter-yearlong ranges are occupied throughout the year but during winter they are utilized by additional animals that migrate from other seasonal ranges. WIN: Winter ranges are used by substantial numbers of animals only during the winter period (November 15 - April 30). SSF: Spring-summer-fall ranges are used before and after winter conditions persist. OUT: The area is not occupied by animals during any time of the year.
Sources: Christiansen (1998), McWhirter (1998a, 1998b, 1998c, 1998d, and 1998e)

currently underway should reveal specific migration pathways used by pronghorns traveling south from northern summer ranges. Once that information is known, impacts due to the project and existing impacts (due to roads, livestock fences, human settlements) can be examined so that barriers to movements may be mitigated. Preliminary studies have shown that antelope from the Jackson/Grand Teton National Park segment of the Sublette Antelope Herd Unit winter on the south end of the Mesa within the PAPA. However, the area experienced an extremely light winter during the first year of this study. In years past the animals have been observed migrating south along a pathway west of Wyoming Highway 191.

Pronghorns in this population have been impacted by fences (livestock and highway rights-of-way), oil and gas developments, and livestock grazing. Pronghorn survival depends on different habitat components in different seasons. Topographic diversity that provides thermal shelter and shrub cover are 2 key elements of pronghorn winter ranges (Cook and Irwin, 1984). Several studies conducted in the region surrounding the project area have revealed the influence of water on pronghorn distribution during winter (Irwin *et al.*, 1984) and especially during summer (Sundstrom, 1969; Alldredge and Deblinger, 1988). These and other studies also emphasized the importance of shrubs, especially sagebrush, in pronghorn diets throughout the year (Severson *et al.*, 1968; Alldredge and Deblinger, 1988).

Pronghorn belonging to the Sublette and Carter Lease HUs inhabit areas which would be crossed by the sales pipelines. The pipelines would pass through pronghorn crucial winter/yearlong range north and south of the Green River and near Granger (BLM, 1998a).

Mule Deer. The PAPA overlaps portions of the Sublette Mule Deer HU. Similar to pronghorn populations in this part of the state, mule deer populations suffered declines after the winter of 1992-93 resulting from a number of factors including harvest, winter conditions, summer drought, and diminished vigor and decadence of shrubs on winter ranges (McWhirter, 1994 and 1998b). Since 1994, restrictive harvests have allowed the population to increase, albeit slowly. Combinations of winter mortality and poor reproduction have influenced the slow population growth since the severe winter of 1992-93 (McWhirter, 1998b).

Approximately 27,220 acres in the PAPA coincide with crucial winter range for mule deer ranges in the Sublette HU (see Table 3-33). Figure 3-20 shows the location of deer crucial winter range in the project area. This crucial winter range comprises the Mule Deer SRMZ. The "breaks" provide thermal cover

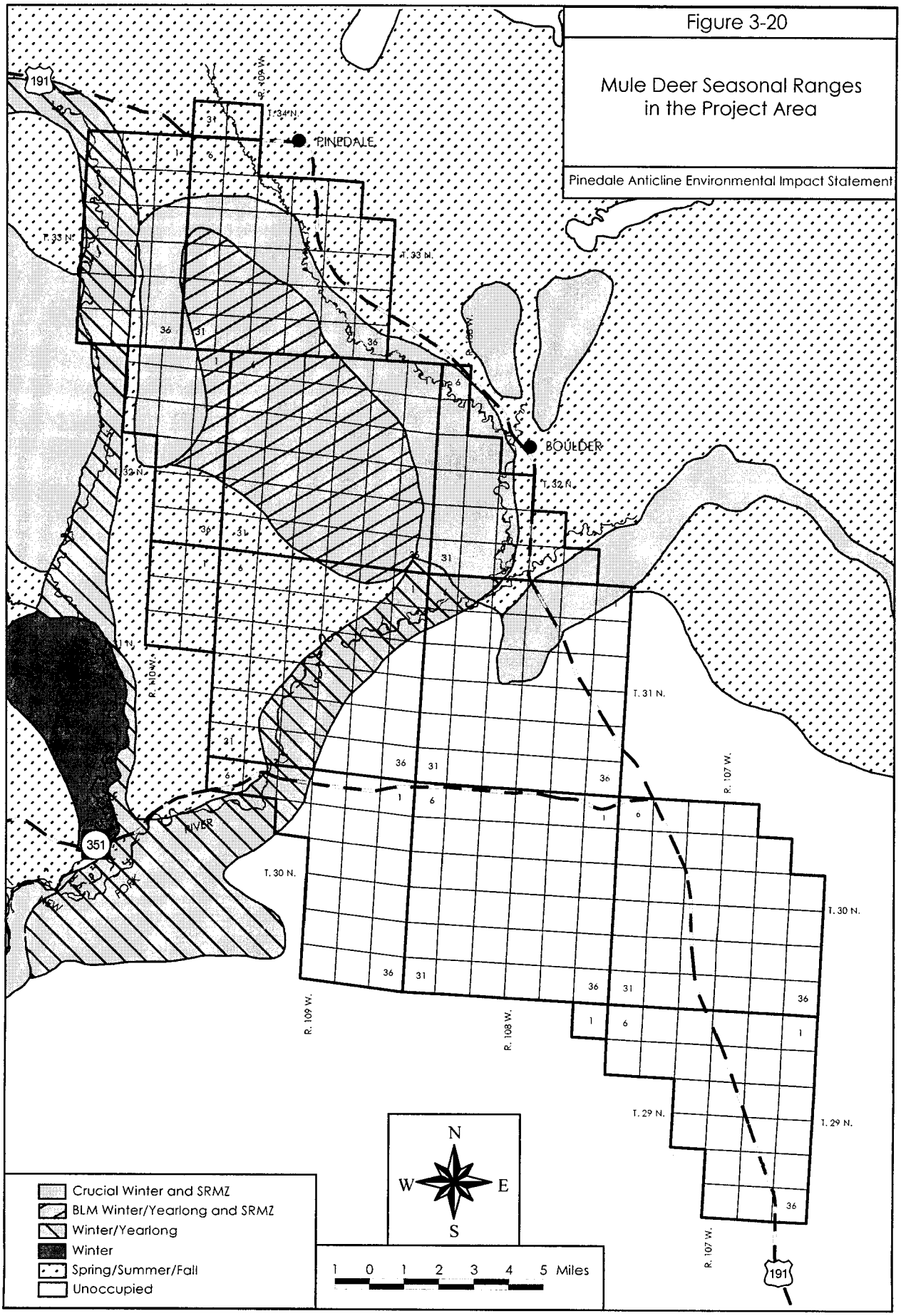


Figure 3-20
Mule Deer Seasonal Ranges in the Project Area
Pinedale Anticline Environmental Impact Statement
191
PINEDALE
BOULDER
T. 34 N.
T. 33 N.
T. 32 N.
T. 31 N.
T. 30 N.
T. 29 N.
R. 109 W.
R. 108 W.
R. 107 W.
351
RIVER
Crucial Winter and SRMZ
BLM Winter/Yearlong and SRMZ
Winter/Yearlong
Winter
Spring/Summer/Fall
Unoccupied
N
W
E
S
1 0 1 2 3 4 5 Miles

during more severe winters. This winter habitat primarily coincides with the sagebrush-mixed grass prairie mosaic landscape found on the northern end of the Mesa where valleys and draws provide forage and shelter. It is important to note that the Mesa crucial winter range forage component is almost entirely composed of sagebrush while most crucial winter ranges in western Wyoming and in the Rocky Mountain west in general include a diversity of browse species. The Mesa crucial winter range also consists of very little topographic relief (i.e., escape areas). Mule deer wintering areas elsewhere in western Wyoming are often located at lower elevations where deer are almost always seen in sagebrush-grasslands (Oedekoven and Lindzey, 1987). Wintering deer tend to select drainages, flat and gentle slopes, and ridges over other topographic features. They utilize south and west aspects more than availability would suggest and more frequently than other exposures (Oedekoven and Lindzey, 1987). Factors that contribute to poor condition of mule deer winter ranges include the prevalence of old, decadent shrubs that are not reproducing (due to the lack of fire or treatment), livestock grazing of vegetation such as winterfat and Gardner's saltbush that could otherwise be utilized by wintering mule deer, fences that may limit mule deer movements, and permanent or temporary oil and gas facilities that have removed wintering habitat over the long-term as well as disturbed areas that have not been successfully revegetated.

Mule deer along the sales pipeline route belong to the Sublette, Steamboat, and Wyoming Range HUs. The pipelines would cross mule deer migration routes and winter/yearlong range, but no crucial habitat occurs along the route (BLM, 1998a).

Moose. Crucial moose winter-yearlong range is in riparian zones associated with the North Fork River, Green River, East Fork River, Pole Creek, Fall Creek and Boulder Creek. Approximately 20,073 acres of crucial winter-yearlong range in the Sublette HU is within the PAPA (Table 3-33 and Figure 3-21). Estimated moose populations in the Sublette HU also declined between 1992 and 1993 but not to the same extent as mule deer and pronghorn populations.

Wintering moose in western Wyoming utilize riparian willow and aspen vegetation (Rudd, 1986; Oedekoven and Lindzey, 1987). Wintering moose appear to select drainages and flat topography found in flood plains but have been found on west-facing slopes more often than other exposures (Oedekoven and Lindzey, 1987). Human activity, degradation of riparian vegetation from erosion, degeneration of aspen due to fire suppression and vegetative succession, increased winter recreation and energy developments have been identified as impacts on moose (Lockwood, 1994).

Along the sales pipeline, winter/yearlong range for moose occurs along the Green and Blacks Fork rivers. No crucial winter range occurs along the routes.

Elk. Although 2 elk herd units overlap the PAPA (see Table 3-33), elk in the Pinedale HU do not occupy any seasonal ranges in the project area. The only occupied elk range coincides with the northern-most 2 sections of the PAPA, north of U.S. Highway 191 between Pinedale and Daniel Junction, which are within winter range of the Upper Green River HU. A small herd of elk frequent the Mesa in the winter and their numbers seem to be correlated with winter severity. These elk most likely originate in the Piney Elk HU or from a small resident group of elk that reside in the riparian area of the Green River. No crucial ranges though, coincide with the PAPA. South of the Green River, the sales pipeline route would cross severe winter relief range which is used during extreme weather conditions when preferred, higher quality habitat is not available. No crucial winter range for elk would be crossed.

Mountain Lion. The PAPA lies within 2 mountain lion hunt areas: Hunt Area 17 south of Pinedale and west of U.S. Highway 191 and Hunt Area 3 east of U.S. Highway 191. Hunt Area 3 has a mortality quota of 5 lions while mortality of 10 lions is allowed in Hunt Area 17. Harvest quotas were attained in 1996 (Rothwell, 1998a).

Black Bear. Only the portion of the PAPA east of U.S. Highway 191 coincides with a black bear hunt area, Area 19. In 1996, 9 black bears were harvested in that area which includes the west slope of the Wind River Range (Rothwell, 1998a).

3.20.3 Waterfowl, Upland Game Birds, Furbearers, Small Game

Waterfowl. The PAPA coincides with WGFD Waterfowl Management Areas (WFMA) 5B, and 5F

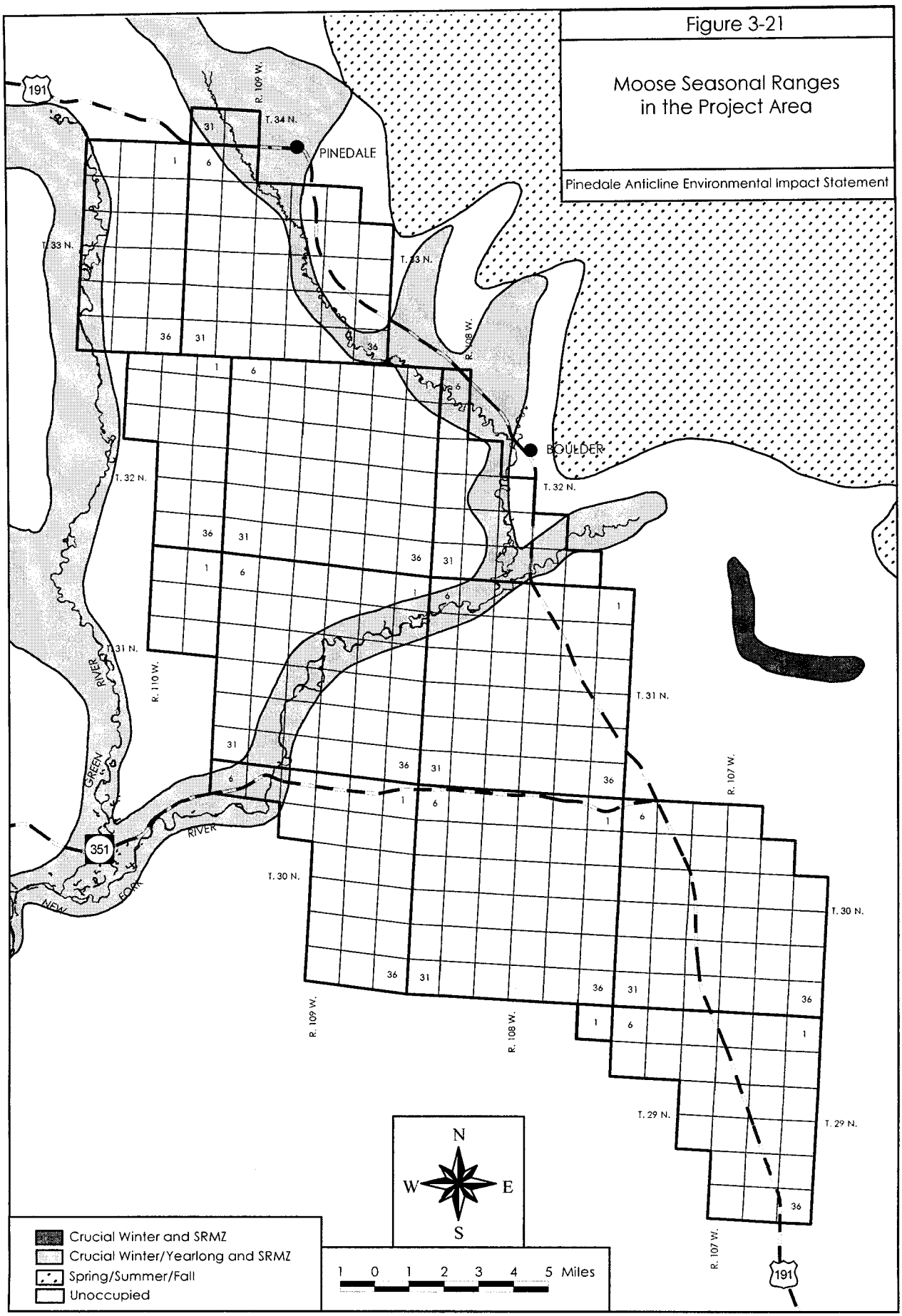


Figure 3-21
Moose Seasonal Ranges in the Project Area
Pinedale Anticline Environmental Impact Statement
PINEDALE
BOULDER
T. 34 N.
T. 33 N.
T. 32 N.
T. 31 N.
T. 30 N.
T. 29 N.
R. 109 W.
R. 108 W.
R. 110 W.
R. 107 W.
GREEN RIVER
NEW FORK RIVER
191
351
N
W
E
S
1 0 1 2 3 4 5 Miles
Crucial Winter and SRMZ
Crucial Winter/Yearlong and SRMZ
Spring/Summer/Fall
Unoccupied

(Rothwell, 1998a) for which harvest data on geese, ducks, coots, snipe, and sandhill cranes are documented (Table 3-34). In these WFMAs, Fontenelle Reservoir, the Green River and its tributaries serve as important nesting habitat and migratory/staging habitats, especially during fall. Species of migratory waterfowl inhabiting the PAPA have been documented during breeding bird surveys coordinated through National Biological Survey or NBS (Sauer *et al.*, 1997) and provide data on species' occurrence and abundance during the spring breeding period for at least the past decade. Data reported from 4 NBS survey routes (Daniel, Boulder, Big Sandy and Ryegrass) show that Canada geese, green-winged teal, mallard, northern pintail, blue-winged and cinnamon teal, American wigeon, bufflehead and common merganser have been observed during spring on or adjacent to the PAPA.

Upland Game Birds. Sage grouse are the most common and important game bird in this part of Wyoming; the likelihood of blue grouse and ruffed grouse occurring near any project component is remote and neither species has been reported in any of the 4 NBS breeding bird survey routes that surround the PAPA. The 2 Upland and Small Game Management Areas (USGMA) that coincide with the PAPA, Sublette and Eden USGMAs, rank first and second, respectively for sage grouse harvest of all USGMAs in Wyoming.

However, recently compiled information shows that sage grouse populations - indicated by harvests - have declined throughout Wyoming over the past 20 years (Heath *et al.*, 1997). This trend has been noted across the western United States. Mourning doves, also upland game birds, may occur near some project components and have been regularly observed in NBS surveys.

Three important habitat components for sage grouse include strutting/nesting grounds, brood rearing areas, and wintering areas. Available data (WGFD data, BLM Field Office files) indicates there are 43 known sage grouse leks within the PAPA (see Figure 3-22). However, not every lek is currently active or has been monitored within the past several years to determine current level of use and there may be some areas within the PAPA that have not been surveyed for leks recently.

Nevertheless, studies currently underway have documented sage grouse nesting in the PAPA. Suitable nesting habitats include areas within 0.5 to 3 miles from leks (Pyrah, 1971; Wallestad and Pyrah, 1974; Martin, 1976; Braun *et al.*, 1977) but sage grouse in the Farson area nested up to 12.2 miles from the lek of capture (Heath *et al.*, 1997). Sage grouse typically nest on the ground beneath sagebrush 15 to 22 inches tall (Braun *et al.*, 1977) and depend on sufficient sagebrush canopy cover for nest concealment (Pyrah, 1971). Sage grouse chicks consume insects and forbs (Peterson, 1970; Wallestad, 1975) and consumption of water is dependent on forb succulence (Wallestad, 1971). During summer, sage grouse tend to stay within 1.5 miles of water where meadow and/or riparian areas along intermittent and perennial streams and playas are important brood-rearing habitats (Hayden-Wing *et al.*, 1985). Recent studies have shown that limited herbaceous vegetative cover (grasses and forbs) is significantly related to nest failure, usually due to predators. These studies point to the influence of livestock grazing on sage grouse reproductive success (Gregg *et al.*, 1994; Heath *et al.*, 1997; Sveum *et al.*, 1998).

Sage grouse are in decline across the western United States. A high level of public interest was expressed in this species during the scoping process. Consequently, important habitat for sage grouse has been identified in the project area and compromises the Sage Grouse SRMZ.

Small Game. Desert cottontails are probably the only small game species in the project area although fox squirrels and snowshoe hares have been harvested within some of the USGMAs that encompass the PAPA (see Table 3-34). Desert cottontails inhabit all vegetation types in the area but the highest populations are expected in greasewood and sagebrush drainages. Nuttall's cottontails have also been reported in the PAPA but they tend to be found at higher elevations in riparian willows, aspen and other shrubby vegetation (Clark and Stromberg, 1987). The desert cottontail is a common food source for golden eagles, ferruginous hawks and other raptor species.

Furbearers. Beaver, muskrat, mink, badger, striped skunk, red fox, bobcat, ermine and long-tailed weasels are expected to occur locally in the PAPA.

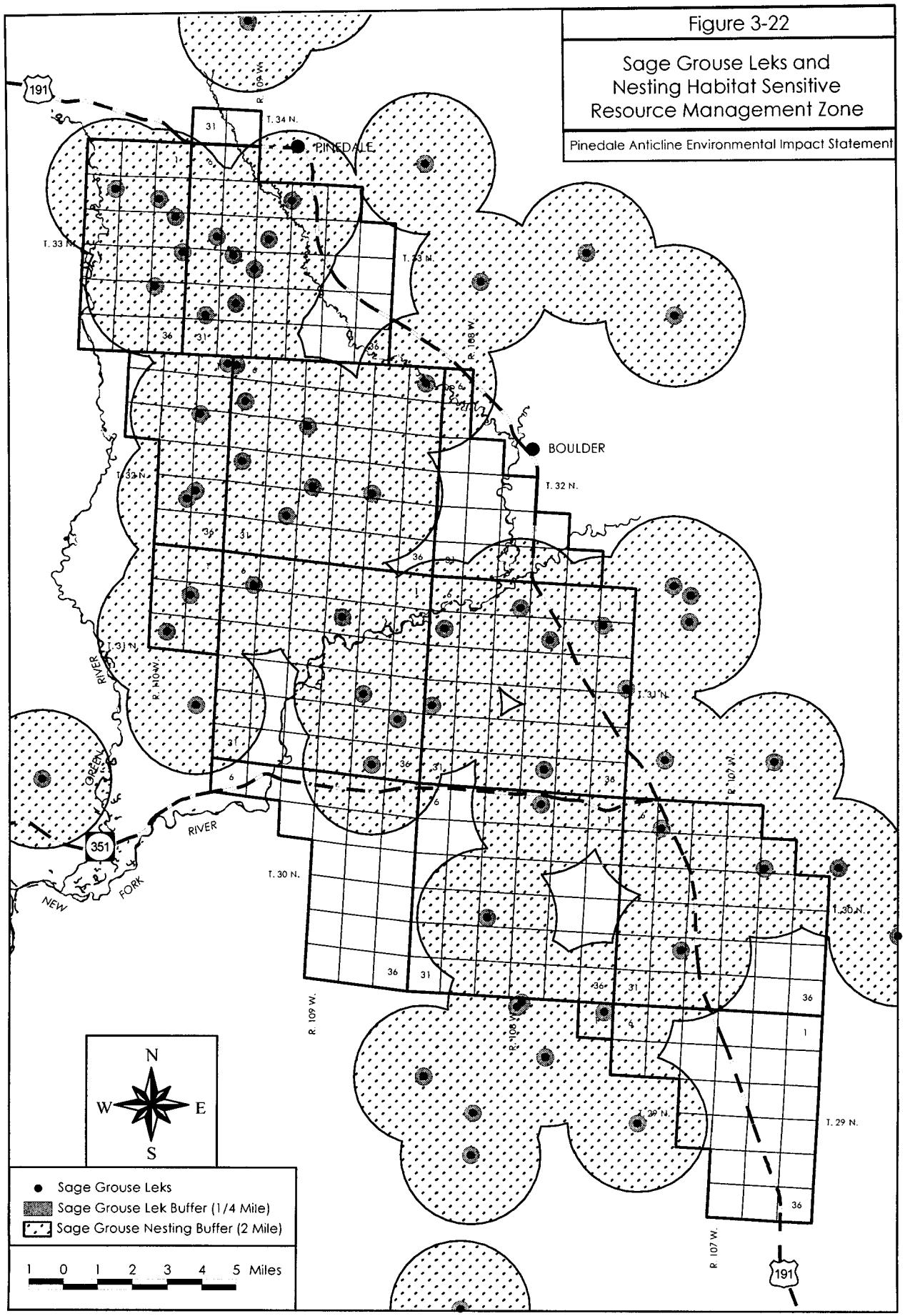


Figure 3-22
Sage Grouse Leks and Nesting Habitat Sensitive Resource Management Zone
Pinedale Anticline Environmental Impact Statement
191
PINEDALE
BOULDER
T. 34 N.
T. 33 N.
T. 32 N.
T. 31 N.
T. 30 N.
T. 29 N.
R. 109 W.
R. 108 W.
R. 107 W.
RIVER
NEW
FORK
351
N
W
E
S
Sage Grouse Leks
Sage Grouse Lek Buffer (1/4 Mile)
Sage Grouse Nesting Buffer (2 Mile)
1 0 1 2 3 4 5 Miles

Table 3-34
Game Species Harvest in Respective Waterfowl Management Areas and Upland and Small Game Management Areas that Coincide With the Project Area

Game Species Category	Management Area	Game Species	1997 Harvest of Species in Management Area
Waterfowl	WFMA 5B - Upper Green River Basin	Geese	784
		Ducks	1,682
		Snipe	63
		Coots	7
	WFMA 5F - Lower Green River Basin	Geese	558
		Ducks	3,641
		Coots	49
		Snipe	63
		Sandhill Cranes	14
Upland Game Birds	USGMA 3 - Sublette	Blue Grouse	996
		Ruffed Grouse	763
		Sage Grouse	2,269
		Mourning Doves	212
	USGMA 7 - Eden	Blue Grouse	14
		Ruffed Grouse	98
		Sage Grouse	1,124
		Mourning Dove	233
Small Game	USGMA 3 - Sublette	Cottontail	890
		Snowshoe Hare	49
		Squirrel	289
	USGMA 7 - Eden	Cottontail	1,152
		Snowshoe Hare	7
		Squirrel	70

Source: Rothwell (1998b)

These species would be expected to occur throughout most of the wildlife habitat types present. Harvest of furbearers is not summarized for different WGFD management areas and consequently not included in Table 3-34.

3.20.4 Raptors. Raptors nesting within the PAPA have been documented by several sources including on-site nesting surveys, BLM records, WNDDB, and NBS breeding bird surveys. At least 12 species of raptors, nest or otherwise, have been observed in the area including bald and golden eagles, ferruginous hawk, red-tailed and Swainson's hawks, northern harrier, prairie falcon, merlin, American kestrel, great horned owl, burrowing owl, and ospreys. Rough-legged hawks are winter residents.

Low rock outcrops and eroded shale-clay bluffs associated with the Mesa and Blue Rim provide suitable nesting substrates for golden eagles, ferruginous hawks, prairie falcons, and kestrels. Nesting by merlins, ospreys, bald eagles, red-tailed hawks, great horned owls and Swainson's hawks is restricted to the cottonwood riparian zones along the Green River and New Fork River. Red-tailed hawks in particular have concentrated nesting populations in that habitat. Northern harriers, burrowing owls, and ferruginous hawks nest on the ground and nest sites occur and are expected outside of the river corridor. Ferruginous hawks have also constructed nests in the tops of basin big sagebrush in intermittent drainages within the PAPA.

Buffers around nest sites have been adopted by the BLM. The area contained within the nest site

buffers comprise the Raptor SRMZ. A map of this SRMZ is not provided to protect the nesting raptors.

Surveys have been conducted for nesting raptors along the sales pipeline corridor (BLM, 1998a). Two known nests are located within 1 mile of the proposed route.

3.20.5 Nongame Wildlife Species. A variety of nongame mammals, birds, and herpetofauna inhabit the PAPA. Nongame mammals known or expected in the project area include dusky and vagrant shrews, bats (long-eared myotis, silver haired bat, little brown bat, big brown bat, and hoary bat), white-tailed jackrabbit, pygmy rabbit, least chipmunk, yellow-bellied marmot, Wyoming and Uinta ground squirrels, white-tailed prairie dog, northern pocket gopher, Ord's kangaroo rat, bushy-tailed wood rat, white-footed mouse, deer mouse, northern grasshopper mouse, voles (heather, montane, meadow, water and sagebrush voles), western jumping mouse, porcupine, and coyote (Luce *et al.*, 1997 and Clark and Stromberg, 1987).

Riparian zones associated with the Green River, New Fork River and their tributaries provide habitats to a variety of bird species. NBS breeding bird survey data (Dorn and Dorn, 1990; Luce *et al.*, 1997) indicates that these habitats and associated riparian croplands support several species of shorebirds (sora, killdeer, long-billed curlew, willet), downy woodpecker and red-shafted flicker, flycatchers (willow, Hammond's, dusky), magpie, Cassin's kingbird, blackbirds (yellow-headed, red-winged, Brewer's), brown-headed cowbird, marsh wren, sparrows (white-crowned, chipping, song), a variety of swallows (tree, violet-green, bank, cliff, barn), yellow warbler and Wilson's warbler, and common yellowthroat. Many of these species undoubtedly nest in the cottonwood-willow riparian zone in tree cavities or tree-shrub substrates. Great blue heron rookeries are common where cottonwoods are present.

Upland grassland, sagebrush, greasewood-saltbush, and rock outcrop habitats present within the study area support numerous nongame bird species which are typical of the semi-arid region of southwest Wyoming. The predominant passerine in the area is the horned lark, a yearlong resident. Common summer visitors in local shrub-dominated habitats include Brewer's sparrow, vesper sparrow, sage sparrow, green-tailed towhee, and sage thrasher. Rock wrens, cliff swallows, bank swallows and Say's phoebes have been seen in rocky draws or along the rock outcrops. Grasslands in the area support species such as grasshopper sparrows, savannah sparrows, western meadowlark, and lark bunting.

Tiger salamanders, northern leopard frogs, boreal toad, and boreal chorus frogs probably occur in emergent wetlands in the project area (WNDDB, 1998; Baxter and Stone, 1980; Luce *et al.*,1997). Mixed grasslands, sagebrush, greasewood-saltbush and rock outcrops are suitable habitats for the northern sagebrush lizard, bullsnake, and prairie rattlesnake. Wandering garter snakes might occur in upland grassland and sagebrush habitats but are more closely associated with permanent water (Baxter and Stone, 1980; Luce *et al.*, 1997).

3.20.6 Aquatic Resources

RMP Management Objective. Riparian area maintenance, improvement, and restoration were identified in the RMP to help promote quality fish habitat on streams and lakes in the resource area. Specifically, the RMP requires efforts to control siltation into the New Fork River be pursued to improve the water quality for that fishery. Water quality standards for other fishing streams will be coordinated with the WGFD and WDEQ. The RMP states that adherence to these standards will help maintain existing fish habitat.

Significant cold water fisheries are present in the New Fork River and Green River. From Fontenelle Reservoir to its confluence with the New Fork River, the Green River is a Class 2 stream, defined by WGFD as very good trout waters with fisheries of statewide importance (WGFD, 1998). Upstream from the New Fork to the USFS boundary, the Green River is classified as a Class 3 stream; important trout waters with fisheries of regional importance. It should be noted that these classifications are for fishery value and should not be confused with stream classifications adopted by WDEQ. In these stretches, WGFD manages fisheries as a basic yield program of providing opportunities for fishing. Stocking brown and rainbow trout and creel possession limits have been management approaches used to ensure yield. Recently, stocking brown and rainbow trout below the New Fork River has been discontinued although

Snake River cutthroat trout are still stocked (Belford, 1996a).

In addition to Snake River cutthroat, brown and rainbow trout, game fish found in the Green River upstream from Fontenelle Reservoir include brook trout, kokanee, and mountain whitefish (the only abundant native species), all of which are abundant or common. Common nongame species include mountain sucker (native), flannelmouth sucker (native), mottled sculpin (native), and white sucker (introduced). Rare introduced game fish are Yellowstone cutthroat trout, Bonneville cutthroat, and grayling. Nongame common carp, Utah chub, and fathead minnow have also been introduced while the roundtail chub is a rare native nongame species (Belford, 1996a).

Within the PAPA, the New Fork River is a Class 2 stream from the confluence with Pine Creek south of Pinedale downstream to the confluence with the East Fork River. Upstream to New Fork Lake and downstream to the Green River, the New Fork River is a Class 3 stream. All stretches of the New Fork are managed as wild fisheries where angling pressure is supported entirely through natural fish reproduction. During the 1980's, however, public perception of reduced large brown trout because of overfishing led to regulations requiring release of all trout less than 16 inches and a possession limit of 2 (Belford, 1996b). Studies indicated trout populations were limited by over-winter mortality and poor habitat in some areas (Belford, 1994) and not overfishing (Belford, 1996b). Regulations were modified to increase harvest of brown and rainbow trout less than 10 inches and protect larger trout, 15 to 20 inches.

The New Fork River supports many of the same game and nongame fish species as the Green River. In addition, rare, native nongame fish found include roundtail chub, speckled dace, flannelmouth sucker and mountain sucker (Belford, 1996b). Tributaries to the New Fork also support game fish populations: (in order from upstream to downstream) Willow Creek - brook, brown and most likely rainbow trout; Pole Creek - brown, rainbow and brook trout; Fall Creek (tributary to Pole Creek) - brook and rainbow trout (WGFD, 1996).

Along the sales pipeline corridor, the Green River below Fontenelle Dam is a Class 2 trout fishery. The river supports brown, rainbow and cutthroat trout as well as kokanee salmon, which spawn in October downstream of the dam. The Blacks Fork supports limited game fish populations and is classified as a Class 4 fishery.